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ROLE OF CONCENTRATION AND SIZE IN THE EFFECTS OF WORLD UNCERTAINTY ON VIETNAMESE BANK CREDIT RISK

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Abstract

Uncertainty is an important concern in banking risk management, as it can undermine the financial system's shock absorption capacity and threaten overall banking stability. Utilizing a sample of 24 Vietnamese joint-stock commercial banks from 2012 to 2022 (Since 2023, several banks have undergone mergers and others have come under central bank control), this study analyzes and evaluates the impact of world uncertainty on credit risk in commercial banks. Additionally, the study analyzes the moderating effects of concentration and size on the relationship between world uncertainty and bank credit risk. By employing the Bayesian regression method and the Gibbs sampling algorithm, the research has obtained several noteworthy results. Firstly, the study finds that heightened world uncertainty exerts an increasing effect on bank credit risk. Secondly, the impact of world uncertainty tends to diminish when the size of banks increases or when the regulation of concentration within the system is strengthened. The results provide important insights for managers and policymakers, serving as a basis for management implications. These implications focus on managing bank size and system concentration to mitigate credit risk for Vietnamese commercial banks.

Keywords Vietnam, Bayesian regression, uncertainty, moderation, credit risk

JEL Classification G21, G32, G34, G28

INTRODUCTION

Uncertainty can be understood as the condition of lacking complete information about future events, leading decision-makers to be unable to anticipate occurrences and resulting in negative consequences (Fontana & Gerrard, 2004). Researchers have consistently focused on uncertainty and its impact on economic agents (Fountas et al., 2018). The uncertainty surrounding economic and financial policies has increased in recent literature (Dang & Nguyen, 2022). The theories of Keynes (1921) emphasize that increasing uncertainty in the business environment exacerbates the issue of asymmetric information, which serves as a fundamental theory driving research on uncertainty. Since the introduction of the Economic Policy Uncertainty (EPU) index of Baker et al. (2016), numerous studies have analyzed the impact of uncertainty on financial intermediaries, particularly focusing on commercial banks. These studies have assessed the effects of uncertainty on the lending activities of commercial banks from both volume and credit quality perspectives.

The World Uncertainty Index (WUI) was introduced by Ahir et al. (2018) and similarly relies on the frequency of the term "uncertainty" related to economic and political contexts in quarterly reports from 143 individual countries worldwide. Most studies focus on reflecting

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uncertainty related to the EPU of individual countries or globally in connection with credit risk. There are very few studies that utilize the WUI. The WUI is considered superior to the EPU due to its reliance on a single source of information from national reports, ensuring a standardized process and structure that maintains consistency over time and across countries. Additionally, Ahir et al. (2018) emphasize WUI with keyword groups that reflect uncertainty, making the WUI a better representative of uncertainty (Nguyen & Dao, 2024). Furthermore, previous studies primarily examine the effects of uncertainty on bank credit risk in developed countries, while evidence for emerging markets is relatively scarce. The implications found are challenging to apply to emerging countries due to their underdeveloped financial markets and differing regulatory frameworks, which create distinct effects of uncertainty on bank credit risk (Dang & Nguyen, 2022). Moreover, the aforementioned research has laid the groundwork for assessing the influence of uncertainty on credit risk; however, questions remain regarding how world uncertainty affects credit risk in developed countries, considering changes in bank size. Additionally, what moderating role does the concentration level of banking systems in developing countries play in influencing WUI's impact on credit risk? Evidence addressing these questions has yet to be found within the scope of the review.

This paper contributes to the literature in several ways. First, it provides evidence of the effect of WUI on banks' credit risk in emerging markets, while noting that studies in this area remain limited. Second, this paper is the first to expand the moderation roles of concentration and size on the relationship between WUI and credit risk. This investigation offers a deeper analysis of how WUI influences credit risk in a developing country context, like Vietnam, addressing a gap not previously explored in the literature.

1. LITERATURE REVIEW AND HYPOTHESES

Uncertainty is a distinctly different and more significant concept compared to risk. Knight (1921) argued that uncertainty refers to situations where probabilities are not measurable or unclear. Knight also argued that profits arise from uncertainty, not from risk; profits are what remains after the costs of production and other expenses have been deducted, and can only exist in a context of uncertainty. Thus, it can be seen that Knight's work laid the foundation for understanding how markets operate in uncertain environments. He emphasized that business decisions must be made in an environment full of unpredictable factors, where estimating probabilities is not always possible.

According to Keynes (1921), uncertainty refers to the possibility of events occurring that cannot be precisely determined. Uncertainty is a situation in which operators have limited knowledge about the states that accurately describe or predict future outcomes. Uncertainty is characterized by ambiguity and reflects the fluctuations of the economy arising from unpredictable economic, political, and monetary policies (Al-Thaqeb et al., 2022).

The topic of uncertainty has been of interest to many scholars in recent years. The analyzed contents are also very diverse with different time and space scopes. Several studies have assessed the impact of uncertainty on the performance of governments, businesses, and households. Drobetz et al. (2018) and Gulen and Ion (2016) found that firms may cancel or postpone their investments if there is an increase in uncertainty. Aaberge et al. (2017) found that households are less willing to spend in times of increased uncertainty. On the macro side, Bloom et al. (2018) found in their research that the total wealth of countries is likely to decline significantly during economic uncertainty.

In terms of credit, several studies by Bilgin et al. (2021), Bordo et al. (2016), and Hu and Gong (2019) indicate that economic policy uncertainty has a significantly negative impact on the credit growth of the banking system. One of the proven causes of credit risk within the banking system is uncertainty. The uncertainty regarding the future makes it difficult for economic agents to recognize or perceive the increasing risks associated with business operations, investments, and consumption, which can lead to over-investment and inefficiency, ultimately resulting in an inability to repay loans as agreed with banks (Minsky, 1977).

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The uncertainty of a country not only impacts the agents within that nation but also affects the transfer of information between different markets globally through various economic environments. When economic conditions are unfavorable and WUI rises, it often complicates debt recovery for banks, thereby exacerbating the issue of non-performing loans (Nguyen & Dao, 2024).

One of the pioneering empirical studies on this subject is by Chi and Li (2017), which examines the effects of EPU on credit risk and lending decisions of Chinese commercial banks. The results show that EPU increases the bank credit risk, particularly for joint-stock banks. The study further reveals that the effect of EPU on credit risk is moderated by the degree of marketization, where financial depth reduces its effect on bank credit risk while enhancing its influence on lending decisions. Caglayan and Xu (2019) investigated the impact of economic policy uncertainty on credit access, non-performing loans, and loan loss provisions from 18 countries. The results indicate that uncertainty reduces credit access while leading to an increase in non-performing loans and loan loss provisions for banks, distorting the stability of the sectors involved. Botshekan et al. (2021) show that non-performing loans in Iranian banks are associated with Global Economic Policy Uncertainty during major global shocks such as the 2008 financial crisis or the COVID-19 pandemic. However, compared to several open economies such as Japan, Singapore, the US, Turkey, and Spain, the correlation observed in Iran is significantly lower. Karadima and Louri (2021) utilized a panel dataset of 507 banks from 4 Eurozone developed countries, including France, Germany, Italy, and Spain, and found that EPU has positive impacts on non-performing loans; and this effect is statistically moderated by bank concentration. Demir and Danisman (2021) found that economic uncertainty decreases the overall growth of bank credit. A deeper analysis of loans revealed that corporate loans have the most substantial negative impact of economic uncertainty. Dang and Nguyen (2022) studied the impact of banking sector uncertainty on credit risk, with findings indicating that banking sector uncertainty increases bank credit risk. In addition, the degree of impact of uncertainty on credit risk diminishes for larger banks. Gozgor et al. (2019) are among the few authors who used the WUI in analyzing the impact of uncertainty on the domestic credit of countries. Using the GMM estimation, the study showed that WUI reduced the domestic credit of 139 countries in the research sample. Bilgin et al. (2021) investigated whether economic uncertainty affects the default risk of Islamic as well as conventional banks differently. Using a sample of 568 banks from 20 countries from 2009 to 2018, the authors used the WUI to conduct a cross-country equivalent measure. The results showed that economic uncertainty increased the default risk of conventional banks but did not affect the default risk of Islamic banks.

Zhang et al. (2022), using a sample of Chinese listed banks, found that economic instability increased bank risk while reducing profitability; the empirical results also indicated that the impact of instability on bank risk and performance tends to be significantly weaker if there is a strong risk management mechanism. Hamdi and Hassen (2022) analyze the impact of EPU on banking performance, credit risk, and lending decisions of listed banks in Tunisia during 1999–2019. The positive impact of EPU on credit risk and the negative impact on loan size and performance were found. Among banks, state-owned banks are most affected by the increase in EPU. Desalegn et al. (2023) examined the impact of EPU and banking competition on the financial stability of the Chinese banking industry. This study found that both EPU and competition reduced financial stability. Orden-Cruz et al. (2023) analyzed the effects of EPU on the credit risk of U.S. commercial banks, considering their size, profitability, and solvency. The findings showed a significant positive impact of EPU on credit risk among U.S. commercial banks. Banks with lower profitability and solvency were found to be more vulnerable to EPU effects on credit risk. The impact of bank size on sensitivity to EPU were inconclusive. Thus, the research findings across these studies consistently indicate that an increase in EPU leads to heightened credit risk for banks in one or more countries. Trinh and Vu (2024) analyzed the relationship between EPU and the stability of listed commercial banks in China during 2018–2022. The results showed a significant positive correlation between China's EPU and bank stability. This finding differs from previous studies, possibly due to the adjusted nature of the Chinese EPU and the unique dynamics in the

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Chinese banking industry. Recently, Dang et al. (2025) assessed the impact of policy uncertainty and economic freedom on the stability of national banking systems worldwide. The study sample included 165 countries from 1997 to 2021. The study used panel data estimation methods (fixed effects model, random effects model, Driscoll-Kraay standard error method, and system GMM model). The findings indicated that uncertainty in world policy, trade policy, and global economic policy negatively affects banking stability. In addition, economic liberalization policies can mitigate the negative impact of policy uncertainty.

From the overview, it can be seen that most studies use the EPU to represent uncertainty in the research model, while very few authors chose the WUI. Large-scale and developed financial markets such as the US, the European region, and China are also often prioritized for analysis by research. Research results also indicate that increased policy uncertainty will lead to increased risks and reduced stability of commercial banks. The authors conducted this study to assess the impact of World uncertainty on the credit risk of commercial banks in Vietnam, an emerging market that has received little attention for analysis. Based on the research findings, the paper proposes several policy implications aimed at mitigating the negative impact of WUI on the credit risk of commercial banks.

Based on the theories and the literature review related to the topic, this paper develops the following research hypotheses:

H01: *There exists a positive effect of WUI on bank credit risk.*

H02: *The impact of WUI on credit risk tends to decrease as the concentration level of the banking system increases.*

H03: *The impact of WUI on credit risk tends to decrease as the size of banks increases.*

2. RESEARCH METHODOLOGY

Based on the relevant theoretical framework and empirical studies on the topic of uncertainty, this research proposes an empirical model to analyze the impact of WUI on the bank credit risk as follows:

$$Credit\ risk_{i,t} = \beta_0 + \beta_1 Credit\ risk_{i,ti,t-1} + \beta_2 WUI_t + \beta_3 X_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where Dependent Variable: *Credit risk:* Credit risk is measured by the non-performing loan (NPL) ratio. Explanatory Variable: *WUI*: The World Uncertainty Index is the main explanatory variable and is used to measure world uncertainty. Control Variables: *X*: These variables reflect the characteristics of banks, the banking system, and the macroeconomic environment.

Specifically, for bank and system characteristics, the variables include bank size (SIZE), concentration level of the banking system (CRT), equity capital (ETA), profitability (ROE), and credit growth rate (LGR). The macroeconomic environment variables include economic growth (GDP) and inflation (INF).

The research expands the basic research model to determine how the impact of WUI on bank credit risk changes under the influence of characteristics related to the size and concentration level of the banking system. To achieve this objective, the study employs an interaction variable between these two factors and WUI. The extended research model (2) is implemented to identify the moderating effect of concentration on the relationship between WUI and credit risk, specifically as follows:

$$Credit\ risk_{i,t} = \beta_0 + \beta_1 Credit\ risk_{i,ti,t-1} + \beta_2 WUI_t + \beta_3 WUI_t \cdot CRT_{i,t} + \beta_4 X_{i,t} + \varepsilon_{i,t}. \quad (2)$$

It is expected that an increase in the concentration level of the banking system will contribute to reducing the negative impact of WUI on credit risk. This is because, in highly concentrated banking systems (where large banks dominate market share), high-risk credit-seeking customers often find it difficult to access loans (Wang, 2018; De Haan & Poghosyan, 2012).

The extended research model (3) is implemented to determine the moderating effect of bank size on the relationship between WUI and credit risk, specifically as follows:

$$Credit\ risk_{i,t} = \beta_0 + \beta_1 Credit\ risk_{i,ti,t-1} + \beta_2 WUI_t + \beta_3 WUI_t \cdot SIZE_{i,t} + \beta_4 X_{i,t} + \varepsilon_{i,t}. \quad (3)$$

Larger banks also provide benefits in risk diversification as they can operate in multiple markets, and product diversification helps spread risk (Salas & Saurina, 2002).

This study uses the Bayesian regression estimation and the Gibbs sampling algorithm to analyze the impact of world uncertainty on the Vietnamese bank credit risk. Following Nguyen (2020), the study uses the normal distribution of N(1,100) for observed variables and the Igamma distribution (2.5; 2.5) for the variances in the model. The prior distribution can be rewritten as follows:

$$\alpha \sim N(1;\ 100), \quad \sigma^2 \sim Invgamma(2,5;\ 2,5). \quad (4)$$

In Bayesian statistics, prior information constitutes the theoretical basis, and conclusions are drawn from known foundations combined with observed data (Van de Schoot & Depaoli, 2014). Consequently, conclusions in Bayesian statistics tend to be more accurate and are increasingly utilized. The advantage of Bayesian methods over frequentist approaches lies in the comprehensive nature of Bayesian analysis, which does not require multiple tests similar to frequentist methods, such as endogenous testing and autocorrelation tests. When the MCMC chains converge, Bayesian inference is deemed robust. In other words, when the MCMC chains converge, all issues encountered by frequentist methods have been addressed, highlighting the superiority of Bayesian methods over frequentist approaches (Sriboonchitta et al., 2019; Nguyen, 2020).

The study uses balanced data collected from many sources. The WUI is collected from the Policyuncertainty website. The bank characteristics are calculated through data from the financial statements of 24 Vietnamese commercial banks from 2012 to 2022. The number of 24 banks selected in the sample is because some banks were merged or controlled by the State Bank of Vietnam, and therefore, these commercial banks are excluded from the sample. Macroeconomic data were extracted from publications by the General Statistics Office of Vietnam (GSO).

3. RESEARCH RESULTS

The statistical results in Table 2 indicate that the average non-performing loan (NPL) ratio, reflecting the credit risk of Vietnamese commercial banks during the study period, is 2.20%. This ratio falls within the threshold set by the State Bank regarding non-performing loans for credit institutions (not exceeding 3%). However, there is considerable variation in the NPL ratio among banks and over time, with the lowest NPL ratio being 0.47% and the highest at 17.93%. The characteristics of the NPL ratio are associated with significant economic features during the study period. Notably, in the early years of the study, the econ-

Table 1. Summary of variables

Source: Authors' synthesis.

Variable	Symbol	Measurement methods	Data sources	Expected sign
Credit risk	NPL	Total non-performing loans/ Total outstanding loans	Financial statement	
World uncertainty	WUI	Log (12-month average value of the WUI)	Policy uncertainty Website	+
Concentration	CRT	Total assets of the three largest banks/Total assets of banks in the system	Financial statement	–
Bank size	SIZE	Log(total assets)	Financial statement	–
Equity capital	ETA	Equity capital/Total assets	Financial statement	–
Credit growth	LGR	(Total outstanding loans$_t$ - Total outstanding loans$_{t-1}$)/ Total outstanding loans$_{t-1}$	Financial statement	+
Profitability	ROE	Net profit after tax / Equity capital	Financial statement	–
Economic growth	GDP	Economic growth rate (%)	GSO	–
Inflation	INF	Inflation rate (%)	GSO	+

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omy reflected the aftermath of the global financial crisis, leading to a rising trend in NPL ratios during 2012–2013. Subsequently, a series of debt management measures were implemented, resulting in a downward trend and stabilization of NPL ratios. In the final years of the study, specifically in 2021 and 2022, NPLs began to increase again due to severe impacts on both the global economy and Vietnam from the COVID-19 pandemic

Table 2. Descriptive statistics

Source: Authors' synthesis.

Variable	Obs	Mean	Std. Dev.	Min	Max
NPL	264	0 .0220	0.0157	0.0047	0.1793
WUI	264	10.1232	0.2450	9.7859	10.1267
CRT	264	0.4317	0.0618	0.3240	0.5310
ETA	264	0.0911	0.0363	0.0406	0.2384
ROA	264	0.0096	0.0074	0.0000	0.0365
SIZE	264	14.1675	0.5049	13.1669	15.3265
LGR	264	0.1994	0.1702	-0.2333	1.0820
GDP	264	0.0580	0.0166	0.0256	0.0812
INF	264	0.0412	0.0234	0.0063	0.0921

Through observation of the estimation results from models (1), (2), and (3) the study finds that the Standard Error (MCSE) of the independent variables is all less than 0.1, the *Acceptance rate* is consistently 1, and the *Efficiency* of the model is greater than 0.01, thus satisfying the conditions. Therefore, with a sample size of MCMC (10,000), the results are deemed reliable.

The diagnostic results in Figure 1 show that the trace plots run smoothly across the distribution while the autocorrelation plot exhibits a rapid drop-off indicating low autocorrelation, and the shapes of the histograms simulate uniform probability distributions. So, the robustness of Bayesian inference can be confirmed.

In addition to graphical diagnostics of the MCMC chains, the study utilizes the Effective Sample Size (ESS) metric to evaluate the convergence of the MCMC chains. The closer the estimated ESS is to the total number of MCMC samples (10,000), the better results are. According to the calculations from Table 4, the estimated ESS for the parameters is 10,000 or approximately 10,000. Therefore, the convergence level of the MCMC chains is relatively high.

The regression coefficients of WUI in all three models are positive, indicating that higher levels of WUI are associated with the Vietnamese bank credit risk. This result is consistent with the hypothesis and supports the studies of Botshekan et al. (2021), Wu et al. (2020), Karadima and Louri (2021), and Nguyen and Dao (2024). WUI reflects

Table 3. Regression results

Source: Authors' synthesis.

Variable	NPL (1)		NPL (2)		NPL (3)	
	Mean	MCSE	Mean	MCSE	Mean	MCSE
NPL_{t-1}	0.5040	0.0079	0.4958	0.0078	0.5086	0.0078
WUI	**0.0008**	0.0004	**0.0009**	0.0004	**0.0028**	0.0005
***WUI*·CRT**	–	–	**–0.0029**	0.0002	–	–
***WUI*·SIZE**	–	–	–	–	**–0.0002**	0.0000
CRT	**–0,0218**	0.0018	–	–	**–0.0255**	0.0018
SIZE	**–0.0019**	0.0003	**–0.0017**	0.0003	–	–
ETA	0.0256	0.0036	0.0316	0.0036	0.0347	0.0035
ROA	–0.2029	0.0170	–0.2344	0.0174	–0.2193	0.0171
LGR	0.0025	0.0006	0.0032	0.0006	0.0035	0.0006
GDP	0.0250	0.0053	0.0179	0.0053	0.0351	0.0054
INF	0.1263	0.0041	0.1372	0.0041	0.1389	0.0041
_cons	0.0320	0.0058	0.0315	0.0056	0.0083	0.0042
var	0.0197	0.0018	0.0196	0.0000	0.0196	0.0000
Number of obs	264		264		264	
Avg acceptance rate	1		1		1	
Avg efficiency: min	0.9200		0.9215		0.9330	

Source: Authors' synthesis.

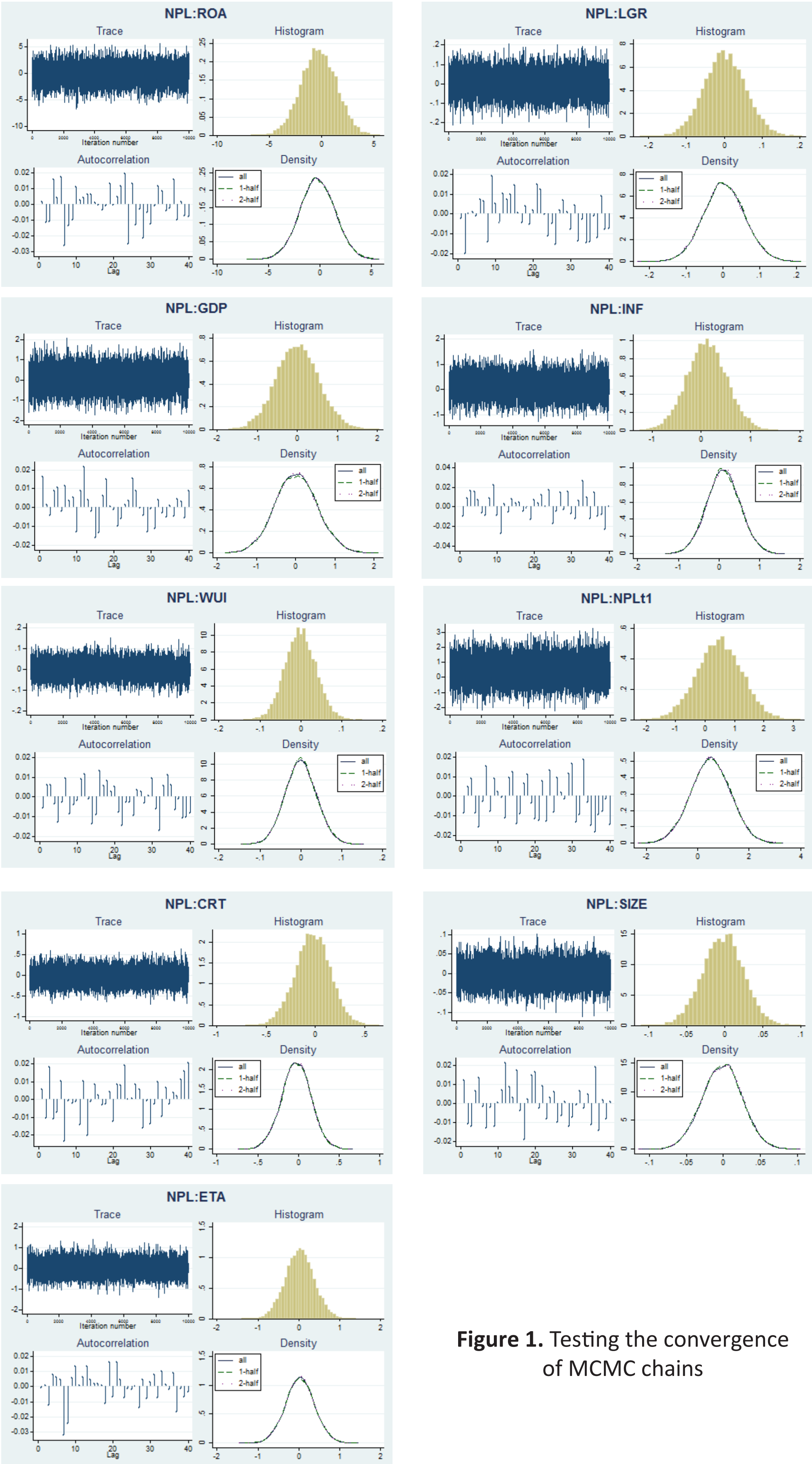

Figure 1. Testing the convergence of MCMC chains

Table 4. Effective sample size

Source: Authors' synthesis.

Variable	ESS	Corr. time	Efficiency
NPL_{t1}	10,000	1.00	1.000
WUI	10,000	1.00	1.000
CRT	10,000	1.00	1.000
SIZE	10,000	1.00	1.000
ETA	10,000	1.00	1.000
ROA	10,000	1.00	1.000
LGR	10,000	1.00	1.000
GDP	10,000	1.00	1.000
INF	9,506	1.05	1.000
_cons	10,000	1.00	1.000
var	9,447	1.06	0.945

both political and economic uncertainties, which heighten the overall likelihood of borrower defaults, thereby increasing risks for banks. A decline in financing demand from borrowers and higher funding costs erode bank profits. To reach profit targets, banks are compelled to seek higher returns by engaging in "high-risk, high-reward" projects, which consequently raises credit risk. Additionally, an increase in uncertainty exacerbates information-related issues, leading to herd behavior in banks' lending decisions. This behavior can further amplify risks if such decisions deviate from the banks' fundamental assessments.

To gain deeper insight into how uncertainty affects credit risk, the study explores two aspects. *First*, does the concentration of the banking system moderate the effect between uncertainty and credit risk? *Second*, does the effect of uncertainty on credit risk differ among banks of varying sizes? To answer the first question, the study analyzes the impacts of concentration on the relation between uncertainty on credit risk. The regression results indicate that the coefficient for this factor's impact on credit risk is negative, meaning that an increase in the concentration level of the banking system reduces the non-performing loans of commercial banks. The regression results from the extended model (2) with the moderating variable concentration in Table 3. show that the effect of WUI on credit risk varies depending on the concentration level of the banking system. Specifically, the regression coefficient for the independent variable WUI on credit risk (NPL) is positive; however, the regression coefficient under the interaction of the concentration factor (WUI·CRT) with NPL is negative. This result implies that the effect of uncertainty on credit risk tends to decrease as the concentration level of the banking system increases. This finding is consistent with the hypothesis and the research results of Karadima and Louri (2021) and Nguyen and Dao (2024). In highly concentrated banking systems (where large banks dominate market share), high-risk borrowers often find it difficult to access loans. A higher concentration in the industry, characterized by a few large banks in the system, can leverage economies of scale and scope, particularly in reducing information asymmetries; therefore, a banking system with higher concentration level helps mitigate negative impacts from WUI more effectively than a less concentrated system. Thus, the study provides empirical evidence supporting the "*concentration-stability*" theory by Uhde and Heimeshoff (2009).

Regarding the role of the bank size, the regression results from the extended model (3) with the moderating variable size in Table 3 indicate that the impact of WUI on credit risk varies across bank size. Specifically, the regression coefficient for the independent variable WUI on credit risk (NPL) is positive; however, the regression coefficient under the interaction of size (WUI·SIZE) with NPL is negative. This result implies that the effect of uncertainty on credit risk tends to decrease as bank size increases. This finding aligns with the hypothesis and the research results of Dang and Nguyen (2022). Larger banks also provide benefits in risk diversification as they can operate across multiple markets, and product diversification helps spread risk. Additionally, larger banks tend to have more highly skilled staff and more effective risk management systems; therefore, larger banks can create a "buffer" that better mitigates negative impacts from uncertainty compared to smaller banks. The research findings also support the *theory of economies of scale* in business operations.

The equity-to-assets ratio (ETA) has a positive impact on credit risk (NPL), contrary to the research result of Dang and Nguyen (2022). When banks increase their capital without a proportional enhancement in risk management capabilities, it can lead to an increase in the non-performing loan ratio, particularly when faced with sudden growth. Additionally, during the study period, the requirement for commercial banks to raise their legal capital as mandated by the State Bank, along with vigorous restructuring activities, may have created pressure to expand higher-risk lending, which would also contribute to an increase in non-performing loans. Return on assets (ROA) has an inverse relationship with credit risk, which aligns with expectations and the result of Ozurumba (2016). Banks with higher profitability are better positioned to mitigate pressure when investing in risky debts, effectively managing operational costs and their non-performing loans. Conversely, banks with lower profitability face significant pressure to increase operational profits, making them more likely to accept riskier credit, thereby increasing the NPL ratio. The research results indicate a positive relationship between credit growth (LGR) and bank credit risk; this result is consistent with the results of Novellyni and Ulpah (2017). When banks are pressured to increase their credit outstanding, they tend to focus solely on attracting customers and boosting lending without adhering to risk management standards, leading to the relaxation of regulations and acceptance of inefficient loans. This can result in increased non-performing loans when issues arise.

The economic growth rate (GDP) has a positive relationship with bank credit risk, and this result is consistent with that of Dang and Chung (2022). Banks may become overly confident during periods of strong economic growth, leading to lax lending practices. Additionally, a high GDP growth does not necessarily result in a reduction in non-performing loans if banks do not implement appropriate credit quality control measures. The inflation rate (INF) has a positive impact on credit risk as measured by NPLs. When inflation rises, leading to increased prices, consumers tend to reduce spending and tighten their expenditures. This results in slower consumption of goods and stagnation in the operations of organizations and businesses, leading to decreased profits and potentially losses that can affect their ability to repay debts. Consequently, this increases banks' non-performing loans.

CONCLUSION

The article aims to assess the impact of world uncertainty on the credit risk of Vietnamese commercial banks in the period 2012–2022. The research findings indicate that an increase in WUI is associated with a rise in credit risk for banks; specifically, the adverse effects of WUI on credit risk can be mitigated as the concentration level of the banking system increases. Additionally, the study finds that during periods of heightened WUI, smaller banks are more likely to experience higher credit risk compared to larger banks. From this result, the research proposes that regulatory authorities should promote the development of larger banks that capture significant market shares, which may involve considering mergers and acquisitions of medium and small banks to create larger entities with greater market presence. Additionally, the research results provide further evidence supporting the need for banks to increase their scale appropriately in line with their capabilities so that they can create a "buffer" to protect themselves. Finally, even in a context of strong and stable economic growth where credit risk may be attributed to banks' decisions, managers should also reduce their incentives to accept risks in order to mitigate adverse consequences on credit risk.

The study has certain limitations, such as not assessing the moderating role of bank-specific factors like state ownership ratios, liquidity, and risk appetite on the relationship between WUI and credit risk. Additionally, macroeconomic factors such as the level of financial integration and national governance capacity have not been analyzed in the model. Therefore, the research could be further developed by incorporating these additional factors.

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AUTHOR CONTRIBUTIONS

Conceptualization: Van Dan Nguyen.
Data curation: Van Dung Ha.
Formal analysis: Van Dan Nguyen.
Funding acquisition: Van Dung Ha.
Investigation: Van Dan Nguyen, Van Dung Ha.
Methodology: Van Dan Nguyen, Van Dung Ha.
Project administration: Van Dan Nguyen.
Resources: Van Dan Nguyen, Van Dung Ha.
Software: Van Dung Ha.
Supervision: Van Dan Nguyen, Van Dung Ha.
Validation: Van Dan Nguyen.
Visualization: Van Dung Ha.
Writing – original draft: Van Dan Nguyen.
Writing – reviewing & editing: Van Dan Nguyen, Van Dung Ha.

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