

# UNDERSTANDING THE LONG-TERM DYNAMICS AND DYNAMIC RESPONSES IN COMMERCIAL BANK CREDIT: A COMPREHENSIVE ECONOMIC ANALYSIS

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## ABSTRACT

*This paper investigates the long-term equilibrium relationship and dynamic responses of economic variables to changes in commercial bank credit, emphasizing foreign direct investment (FDI) and non-performing loans (NPL). The study also examines how bank credit dynamics respond to shocks from other economic variables, such as interest rates and inflation. Using a vector error correction model (VECM) to analyze time series data, the findings reveal a significant long-term equilibrium among FDI, NPL, and commercial bank credit, offering insights into their interrelationships. The results highlight the importance of understanding these dynamics for stakeholders as they illuminate the variability of commercial bank credit. Furthermore, the research underscores the need for banks to consider the impacts of interest rate fluctuations and inflation on credit dynamics, equipping stakeholders with tools to identify risk-oriented features in a dynamic economic environment. However, the study is limited by its focus on a specific period and geographic region, which may affect the generalizability of the findings. Future research should consider incorporating more diverse datasets and exploring additional factors influencing bank credit dynamics. Overall, this study enhances the understanding of long-term interconnections among these economic variables, providing valuable insights for developing effective economic policies.*

**Keywords:** *Economic Dynamics, Commercial Bank Credit, Economic Growth, Inflation, Interest Rate*

## A. INTRODUCTION

The financial system is one of the key elements of the country's economic structure. This system must be stable and efficient as a mechanism for distributing capital among those who need it and those with a surplus. Indeed, the degree of economic growth depends on the effectiveness of the distribution mechanism. Financial crises often result from the financial system's instability and entail high costs for elimination. Banks are especially important in the financial system as intermediary institutions that collect and allocate funds in the economy through deposits and loans. Credit growth is a significant indicator that affects banking

stability. Credit distribution by banks not only influences consumption, investment, and trade activities but also significantly impacts a country's overall economic performance.

Credit distribution is complex, and the account officer's role in credit analysis is crucial to avoid potential risks. Factors such as the amount of capital banks hold influence credit distribution policies, with banks with larger capital reserves having greater flexibility to distribute credit. Several bank-specific and macroeconomic factors influence the demand and supply of credit. Sectoral risk, credit failure rates, capital shortages, interest rates, exchange rates, and export destinations are some factors that need to be considered. In the development context, the government significantly emphasizes alleviating social inequality, mainly through support for small and medium enterprises.

Banking stability reflects the health condition of banking and can be measured by its resilience to financial stress. Proper risk management and a less risky loan portfolio are vital to maintaining banking stability. Bank profits also play an essential role in absorbing negative impacts, while high levels of non-performing loans can harm bank profitability. Financial stability is achieved when the financial system can carry out the functions of intermediation, payment system, and risk spreading without being affected by economic shocks that may arise.

Several studies related to bank credit provide in-depth insight into various aspects that influence the financial sector. In research by Georgoutsos & Moratis (2017) The focus is on risk contagion in the Eurozone banking sector, providing an understanding of how risk can spread throughout the financial system. Apergis & Chatziantoniou (2021) explore credit supply conditions and the business cycle, emphasizing banks' responses to economic change.

Meanwhile, research by Su et al. (2021) is useful to provide a certain perspective on the role of bank credit in maintaining house price stability in China because it is focused on the interactions between the banking sector and the housing market. The study by Bu et al. (2023) reveals the risks of FinTech in China, providing a comprehensive understanding of the challenges and dynamics of financial innovation. Bezemer et al. (2020) deepen understanding of the impact of mortgage lending innovations on business credit, while Sakuragawa et al. (2021) analyze the relationship between the housing market and bank credit in China, highlighting the global aspect of this interaction.

Within the framework of environmental sustainability, Duong et al. (2023) investigated the trilogy between power, green credit, and core competencies of commercial banks in Vietnam. Research by Baldwin & Alhalboni (2023) explores measures of market power for participatory Islamic bank deposits, providing insights into the specific characteristics of the

Islamic financial sector. Zouaoui & Zoghlami (2020) explore the impact of central banks' digital currency news on stock markets and commercial banks in the Middle East and North Africa. Foglia & Angelini (2020) analyze the bank risk circle in a financial context. Kladakis & Skouralis (2024) investigate credit downgrades and systemic risk. Finally, research by Balke et al. (2021) have established the financial intermediation approach, including the shocks in demand for credit and the supply of funds to banks.

However, several research gaps need to be addressed after investigating the impact of shocks of an economic nature on the conventional commercial bank credit in Indonesia. First, the potential of using VECM remains underexplored. It is suggested that in the future, researchers should use the model to investigate the researchers' short-term and long-term impact of the shocks of an economic nature on the conventional commercial bank credit (Enders, 2014; Gujarati, 2004). Second, more emphasis should be placed on conducting studies that focus on sustainability. In this view, research that focuses on understanding cointegration between the variables of the economy, which reflect the shocks, and the variables of the conventional commercial bank credit is required (Engle & Granger, 1987). The research will help better understand the long-term relationship between the two variables.

In conclusion, a more detailed analysis of econometric results related to examining the link between economic shocks and credit would be that the necessity of considering additional factors affecting the dynamics of the relationship becomes apparent (Brooks, 2019). The area of potential research might be the validation of the structural stability with VECM due to the possibility of changes in the way economic variables might be linked to credit during the period of a shock (Gil-Alana & Carcel, 2020; Seth & Sharma, 2015). It is also important to validate the VECM model's results using empirical data encompassing actual economic shocks in Indonesia.

This paper investigates the long-term equilibrium relationship and dynamic responses of economic variables to changes in commercial bank credit. By addressing these gaps, the present research has several potential advantages. It could substantially contribute to how economic shocks impact conventional commercial bank credit in Indonesia. Also, considering these details might provide additional benefits for a deeper theoretical understanding of developing efficient economic policies in the future.

## **B. LITERATURE REVIEW**

Various researchers have conducted literature review studies that offer in-depth insights into the role and impact of credit in various economic and financial contexts. Balke et al. (2021) explore aspects of credit demand shocks, financial intermediation, and funds supply. Their primary focus is understanding the dynamics of credit demand and its linkages with financial institutions. Continuing, Baldwin & Alhalboni (2023) contributed insights regarding the size of the participatory market power of Islamic bank deposits, which provides a deeper understanding of the market position of Islamic banks in the financial industry. Su et al. (2021) investigate the role of bank credit in containing the decline in house prices in China, providing a perspective on the contribution of the banking sector to the stability of the property sector.

Later studies, such as those by Bu et al. (2023), explored FinTech risks in China, identifying potential risks that come with advances in financial technology. Duong et al. (2023) conducted a study involving the trilogy: “Power, green credit, and core competencies of commercial banks in Vietnam,” shedding light on the relationship between economic sustainability and environmental responsibility in the performance of banks. Foglia & Angelini (2020) draw attention to the complexity of risk in bank activities by studying the bank’s risk circle. Sakuragawa et al. (2021) examine the connection between the property market and bank activities through examining China’s housing market and bank credit.

Zouaoui & Zoghلامي (2020) focused on analyzing the impact of central bank digital currency news on stock markets and commercial banks in the Middle East and North Africa. It is closely tied to the research of Bezemer et al. (2020) examining the effect of mortgage loans on business credit since the latter study attempts to trace connections between housing and business in the context of mortgage lending. Kladakis & Skouralis (2024) investigated credit downgrades and systemic risk, although it is more of a broad study providing a general overview of the impact of credit downgrades on the financial system's stability. Zhang & Li (2018) focused on the research conducted to measure credit and market risks in the financing of the banking sector in China, which helps achieve an intricate picture of risk management in the Chinese banking system.

Cafiso & Rivolta (2023) also need to be mentioned since they provide information on the role of non-bank financial institutions from the monetary policy perspective. In this study, the authors refer to the traditional operation with credit lines as monetary policy instruments and the development of monetary policy and non-bank institutions. Apergis & Chatziantoniou (2021) shed light on credit supply conditions and the business cycle in bank credit, thus

discussing the relationship between credit supply and economic activity. Yang et al. (2021) provide an awareness of the role of banks in supporting their international trade activities based on the study of trade and bank credit financing. Blickle (2022) analyzes the contribution of local banks in the development of the housing sector and their impact on property prices through research on local banks, credit supply, and house prices.

Thus, by examining the relationship between housing market conditions and the banking sector's health, Benbouzid et al. (2018) focused on analyzing the housing market and the UK banking sector's credit premiums. Georgoutsos & Moratis (2017) reflected on the issue of risk contagion in the Eurozone banking system and how risk could be transmitted among financial institutions within the particular economic area. Examining the issue of interdependence between financial institutions and the government in managing financial risks, Peng (2021) analyzed the transmission of default risk from banks to the state.

### **C. RESEARCH METHOD**

This research takes a quantitative approach, using secondary data in monthly time series from 2012 to 2023. The primary data source is financial reports published by the Financial Services Authority (OJK), Bank Indonesia (BI), and the Central Statistics Agency (BPS). The research sample involves all commercial banks operating in Indonesia, including state-owned commercial banks, regional development banks, and national private banks. A sampling method is used in this research, which involves a comprehensive sampling approach known as census sampling. In this context, census sampling includes all commercial banks operating in Indonesia as the research sample.

The research variables consist of some economic aspects, namely inflation (INFL), exchange rate (EXHRT), interest rate (IRTR), foreign investment (FDI), bad debts (NPL), economic growth (EGRW), crisis (CRS), and commercial bank credit (CRDR). The use of the Vector Autoregression (VAR) model is the primary approach in this study. However, the data does not show stationarity at the level; it is stationary in the first difference and shows cointegration. In that case, the model will switch to the Vector Error Correction Model (VECM).  $\Delta Y_t$  is a column vector representing changes in the dependent variable values at time  $t$ ,  $\Pi_i$  is the coefficient matrix associated with  $\Delta Y_{t-i}$  where  $i$  denotes a specific lag,  $D_t$  is a matrix of dummy vectors including dummy or deterministic variables influencing the dependent variable,  $\varepsilon_t$  is a residual vector containing random errors at time  $t$ .

$$\Delta Y_t = \Pi_0 + \Pi_1 \Delta Y_{t-1} + \Pi_2 \Delta Y_{t-2} + \dots + \Pi_p \Delta Y_{t-p} + \Gamma D_t + \varepsilon_t$$

VAR and VECM analysis involve several test stages, including a data stationarity test, an optimum lag test, a stability test, a cointegration test, VECM analysis, Impulse Response Function (IRF), and Forecast Error Variance Decomposition (FEVD). The Vector Autoregressive Model (VAR) method is vital in forecasting multiple variable time series data. However, the Vector Error Correction Model (VECM) approach becomes more suitable when the data is in a non-stationary but cointegrated condition. The application of VECM to VAR analysis will provide answers to the objectives of this study and involves a series of tests and analyses to ensure the accuracy and reliability of the results.

#### D. RESULTS AND DISCUSSION

This study completes the stationarity test using two approaches, Augmented Dickey-Fuller and Phillips-Perron, reflecting on the level at which the variables analyzed are stationary. Comparing these results, the significance and nature of both tests show whether the process used should be considered a stationary series or transformed using another approach. The ADF and Phillips-Perron test results for the variables CRDB, INFL, EXHRT, FDI, NPL, EGRW, and CRS are shown in Table 1. Referring to these results, the variables CRDB, INFL, EXHRT, FDI, NPL, EGRW, and CRS are not stationary at the level.

At the same time, after first-order differencing, all variables prove to be relatively stationary at a 5 percent significance level with a p-value of less than 0.05. Therefore, after the first differencing process, the variables become stationary. This finding has important implications in time series analysis, allowing the use of differenced data as a basis for further modeling. Thus, the results of this stationarity test provide a strong basis for continuing the analysis and model development by ensuring that the data used meets the basic assumptions of the time series model to be applied.

Table 1. Stationarity Test

Indicator	Augmented Dickey-Fuller		Phillips-Perron	
	Level	Difference	Level	Difference
CRDB	0.7255	0.0000*	0.0001*	0.0001*
INFL	0.2232	0.0000*	0.4413	0.0000*
EXHRT	0.1264	0.0000*	0.1016	0.0000*
FDI	0.1275	0.0000*	0.0001*	0.0001*
NPL	0.0508	0.0391*	0.2109	0.0000*
EGRW	0.1488	0.0002*	0.2484	0.0000*

Indicator	Augmented Dickey-Fuller		Phillips-Perron	
	Level	Difference	Level	Difference
CRS	0.4748	0.0000*	0.4603	0.0000*

Sources: Data Processed (2024)

The results of the Johansen test for co-integration between variables indicate the presence of a co-integrating vector in this dataset. Some null hypothesis scenarios were evaluated, and some conclusions can be drawn based on the Trace test statistic. First, rejecting the null hypothesis "None" concludes that at least one co-integration vector exists. Likewise, by rejecting the null hypotheses "At most 1" and "At most 2", we can conclude that there are at least two and three co-integrating vectors, respectively.

Table 2. Johansen Test

Hypothesized	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.395436	255.6543	187.4701	0.0000
At most 1 *	0.353163	187.2127	150.5585	0.0001
At most 2 *	0.295337	127.9628	117.7082	0.0096
At most 3	0.170050	80.35799	88.80380	0.1742
At most 4	0.149355	55.00906	63.87610	0.2218
At most 5	0.111646	33.00958	42.91525	0.3359
At most 6	0.090374	16.90929	25.87211	0.4218

Sources: Data Processed (2024)

However, when we reach the null hypothesis of "At most 3" to "At most 6", we cannot reject the hypothesis. That is, there is an indication of three to six co-integrating vectors in this dataset. Therefore, we can consider at least three co-integration vectors for further modeling. This result has important implications in time series analysis, allowing the establishment of a Vector Error Correction Model (VECM) to understand the long-run relationship between variables. VECM will allow handling both short-term and long-term dynamics, providing further insights into analyzing the relationship between economic variables.

Table 3 presents an evaluation of different models at various lag counts. As the table demonstrates, it is possible to assess and compare model performance using such evaluation metrics as log-likelihood, likelihood ratio test statistic (LR), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ). The number of lags to be

used in the developed model can be identified by the number of the best lag according to the optimal lag test results based on SC. In this case, the lower the SC, the better the model.

Tabel 3. The Best Optimal Lag for the Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1438.982	NA	3.79e-20	-22.01510	-21.83864	-21.94340
1	2821.413	2573.450	5.90e-29*	-42.29867*	-40.71050*	-41.65334*
2	2860.596	68.11708	8.73e-29	-41.91686	-38.91698	-40.69791
3	2921.169	97.84832	9.46e-29	-41.86413	-37.45254	-40.07156
4	2984.438	94.41762	1.01e-28	-41.85289	-36.02959	-39.48669
5	3033.507	67.18598	1.38e-28	-41.62318	-34.38817	-38.68335
6	3107.987	92.81383*	1.35e-28	-41.78441	-33.13769	-38.27096
7	3173.483	73.55766	1.60e-28	-41.80744	-31.74901	-37.72036
8	3241.317	67.83392	2.00e-28	-41.86642	-30.39628	-37.20572

Sources: Data Processed (2024)

As the results provided in Table 3 suggest, lag one is the best compared to other lags, and it is obvious that lag one has a lower value than lag four. Thus, the time series model will use one lag as the optimal number of lags according to SC. This lag has been chosen because it represents the balance between accuracy and complexity. This choice will contribute to a better understanding of critical issues that should be considered while developing the time series model, such as prediction and data meaning, as it provides both the ability to predict the future with an acceptable level of accuracy and an appropriate level of detail.

Table 4. Short and Long Term

Indicator	Coefficient	Standard Error	t-statistic
Short-Term			
CointEq1	0.005218	0.00231	2.26189
INFL	0.081643	0.19298	-0.021307
EXHRT	0.014553	0.04639	0.31370
IRTR	-0.309587	1.63821	0.31370
FDI	-0.001372	0.00278	-0.49346
NPL	0.132000	0.03453	3.82284*
EGRW	0.153587	0.13044	1.17746
CRS	-0.007331	0.00848	-0.86442



Indicator	Coefficient	Standard Error	t-statistic
C	0.007147	0.00140	5.11880
Long-Term			
INFL	15.57848	5.94265	2.62147*
EXHRT	-0.324556	1.66191	-0.19529
IRTR	-6.008769	18.2268	-0.32967
FDI	0.420989	0.14157	2.97376*
NPL	-1.938129	0.83817	-2.31233*
EGRW	1.257053	3.07789	0.40841
CRS	-0.201076	0.16352	-1.22969
C	2.190097		

Sources: Data Processed (2024)

### ***Inflation***

The results reveal that inflation does not affect bank loans in the short run. However, it has an effect in the long term. Banks mainly consider short-term microeconomic factors as well as internal bank financial considerations. This is because, as a macroeconomic indicator that measures the difference between the bank's output and employment level, inflation does not impact lending policy in the short run. Instead, banks chose the credit risk evaluation and the bank's financial viability (Betz et al., 2020; Driss et al., 2021). Changes in the price of goods and services and monetary policy easing or tightening have an effect in the long run. When designing a long-term credit policy, banks look at the overall and comprehensive effect of the inflation rate (El Alaoui et al., 2019; Niken et al., 2023).

Banks also modify lending policy to brace themselves for changes caused by macroeconomic factors, such as the inflation rate. The consumption and investment of people and businesses are critical factors in designing lending policy. These are mainly considered when formulating a long-term lending policy. As long-term risks associated with inflation vary, a significant change in the rate of inflation impacts the overall health of the economy, and banks adjust their loan portfolio to manage these risks (Rungcharoenkitkul, 2012; Sinyakov & Yudaeva, 2016).

### ***Exchange Rates***

Exchange rates do not frequently impact bank lending in the short or long run. At best, the direct impact of exchange rate changes on banks' lending or credit choice is limited to the short term. That is because the exchange risk premium is an example of market volatility. It

should be noted that such market volatility does not directly affect banks' lending policies (Arnold & Auer, 2015; Hadian & Adaoglu, 2020).

Besides, banks can also use financial instruments to mitigate the risk they face in the forward or futures markets. More importantly, although exchange rate risk poses a lot of uncertainty about the exact amount of total payments or cash inflows that the bank will finally receive, the banks themselves and counterparty risk are managed very well through many other hedging policies or methodologies.

Thus, the impact of exchange rate fluctuations on the differences between bank lending or credit policies and short or long-run practices cannot be determined. Since using financial instruments or hedging policies aimed at active exchange rate management will most likely affect lending policy, they are minimized. In addition, banks may consider global and regional economic conditions and international trade when determining their lending policy (Al-Khazali, 2014; Gani, 2017). If the exchange rate is not a factor directly responsible for the changes in these economic conditions, then its impact on lending policy is minimal.

### ***Interest Rates***

Interest rates do not significantly impact banks' lending, even in the short and long run. Some external forces can directly influence interest rates on the decisions of banks to lend, as stated by Setterfield. Such factors include present-time global economic conditions and the policies that revolve around the forces of demand and supply. In addition, market state policies and the bank's monetary structure, like employing fixed interest rates and funding structures that are less substantial in responding to the treatment of interest rates, can reduce the magnitude of interest when exposed to bank policies.

The present literature clarifies that interest rates do not greatly influence banks' lending policies and performance in the long and short run. Other macroeconomic factors, like the condition of the economy and the state of the market, influence the banks more than the interest rates (Asbeig & Kassim, 2015; Moya-martínez et al., 2014). Banks are more capable of adjusting their policies based on the current condition of the economy and the risks surrounding the market than they are of adjusting to interest rates.

However, the short-run and long-run stability of interest ratios forces banks to make substantial changes to their lending policies and be least concerned about making such a decision. Further, such existing banks make financial position shields that can protect their financial businesses based on factors that relate to interest rates, and they include derivative financial instruments and hedging policies.

### ***Foreign investment***

In the short run, foreign investment has not significantly impacted bank credit yet. These results may have arisen because foreign investment has not yet entered the country. Currently, the investment projects that foreign investments should go to are not yet there, as implementing such projects requires time. As a result, banks do not see the impact of these processes on their loan portfolios.

Moreover, evaluating the long-term risks for a long-term project financed by a foreigner reasonably takes time. Therefore, the impact becomes noticeable only when the project that has been invested in is already working. Additionally, the changes to the foreign investment's long-term policy form the changes in the banks' long-term lending policies. Banks' lending policies change after a relatively long period to support the mature projects: the banks' lending increases, or the associated risks decrease (Guzman et al., 2018; Huang et al., 2020).

From a longer-term perspective, foreign investment will likely have a more pronounced effect on the country's overall economic growth. Particularly, the investment projects that have already been implemented should affect the demand for credit by the sectors to which they belong (Griebeler & Wagner, 2017; Guzman et al., 2018). In this sense, they can force the banks to fund them. Market changes and the sustainability of foreign investments may lead to corresponding changes in the banks' loan portfolios. In this sense, the banks react to the development of the situation in the markets and the adjustments required to ensure the sustainability of the foreign investments.

### ***Non-Performing Loan***

The impact of bad debts on bank credit is significant for both the short and long term. In the short term, an increase in bad debts tends to pressure the bank's liquidity. If any payments are required as soon as possible, the bank's aggravating inability to meet its immediate payment obligations may cause a quick reaction on its behalf. Besides, an increase in credit and risk indicated by the bad debts may cast doubt upon the bank's trustworthiness, leading to the refusal of customers and investors to provide banks with funding or capital (Ghosh, 2017; Tarchouna et al., 2017).

In the long run, the impact is increasingly more serious, as banks have to restore the customers' trust and ensure that such severe risks do not threaten the credit ability of the bank. As for the effects on the companies and individuals obtaining the bank sources of funding, these run the risk of not gaining access to the bank sources of credit; bad loans may force banks to change the system of providing loans, becoming more selective with the individuals or

companies eligible for credit, changing interest rates or reducing credit capabilities. As for broader effects of bad debts, they also can take a long time to appear: in case of ever-increasing bad debts, a bank will need help to ensure the growth and operation of its business, and inability to secure such help may lead to a drop in a bank's market position or even bankruptcy.

### ***Economic Growth***

Economic growth does not significantly impact bank lending in the short and long term. The subject banks have implemented effective risk management policies to cope with economic fluctuations without drastically changing lending policies. Furthermore, a well-diversified loan portfolio can be a factor that minimizes the direct impact of changes in economic growth on bank credit quality. Banks can reduce the risk associated with volatility in a particular sector by having a variety of sectors in the portfolio (Ceesay & Ndiaye, 2022; Usman & Bashir, 2022; Were & Wambua, 2014).

The use of sophisticated risk models can also be an essential contributor. Banks that rely on sophisticated technology and data analysis can more effectively identify, measure, and manage credit risks arising from changes in economic conditions. Lastly, these banks continuously adapt their lending policies to current economic conditions. A lending policy that can adapt quickly to changes in economic dynamics can help the bank maintain its credit stability.

### ***Crisis***

The short and long-run effects of the crisis did not impact bank credit. One of the reasons is that the government's stabilization policy and intervention effectively addressed the crisis. Having implemented policy measures on the same, which supported the banking sector's stability, which included providing liquidity to banks, stimulating the economy, and protecting bank loans from credit, the availability of stable bank credit balances increased.

Other results of this study may be reflected in the fact that those banks that have carried out good risk management and have a sustainable loan portfolio are resistant to crises (Chu, 2020; Cieslak & Schrimpf, 2019; Olson & Zoubi, 2017). If the quality of credit the bank lends at the beginning is high and not of concern to the stability of its loan portfolio, no bad debts will appear for the bank, and there will be no problem with the credit being stressed.

Another reason may be the impact of having lending policies that respond to dynamic changes in economic activity. If the bank has risk management systems capable of identifying risks that occur with customers or other banking institutions with which it cooperates and

ensures diversification of its revenues and income from non-credit-related financial services, its credit quality will continue to be excellent.

Any banks that continue to operate selectively and flexibly despite their inability to assess loan risks will provide stable bank credit. In the long run, banks' exposure to various income sources, such as credit, placements of securities in money and capital markets, and the provision of services, is considered positive. Diversifying sources reduces the bank's dependence on a certain specific sector and maintains balance.

### ***Impulse Response Function***

The impulse response function is an analytical tool within the field of econometric analysis that allows for the measurement of the immediate and long-run effects of a one-standard-unit change in the independent variable on another dependent variable. The dependent variables analysed in the given IRF results are inflation (INFL), exchange rate (EXHRT), interest rate (IRTR), foreign investment (FDI), bad debts (NPL), economic growth (EGRW), and crisis (CRS), whilst the focus is placed on the dependent variable response to commercial bank loans.

The Impulse Response Function results provided in the article show the extent of the dependent variable's response to changes in the economic variables in the different periods. Given the data at our disposal, the response value of the commercial bank loan seems to depend on the dynamics of the period. Therefore, it is self-evident that commercial bank credit is somewhat tempered by the country's prevailing economic trends and macroeconomic policy.

The response of the commercial bank credit to inflation shows the first response to be positive in the early period; however, it declines in subsequent periods. This response suggests that commercial bank loans tend to respond positively to an increase in the inflation rate, although temporarily. Moreover, the response to the exchange rate is positive at the beginning of the period but declines as time progresses. This response would imply that the changes in the exchange rate may affect the commercial bank credit; however, the changes are temporary.

Moreover, it is evident that the response to interest is positive initially but may decline over time. This demonstrates that commercial bank credit responds favorably to an increase in interest rate, but the response may diminish over time. The response to foreigners is also positive initially, but may level off over time, meaning it is finite. The level of economic response to interest rates may increase in other periods, but the response level for the initial period is significant. Period two has a high level of interest rate response compared to other periods so that it may have a finite level of response.

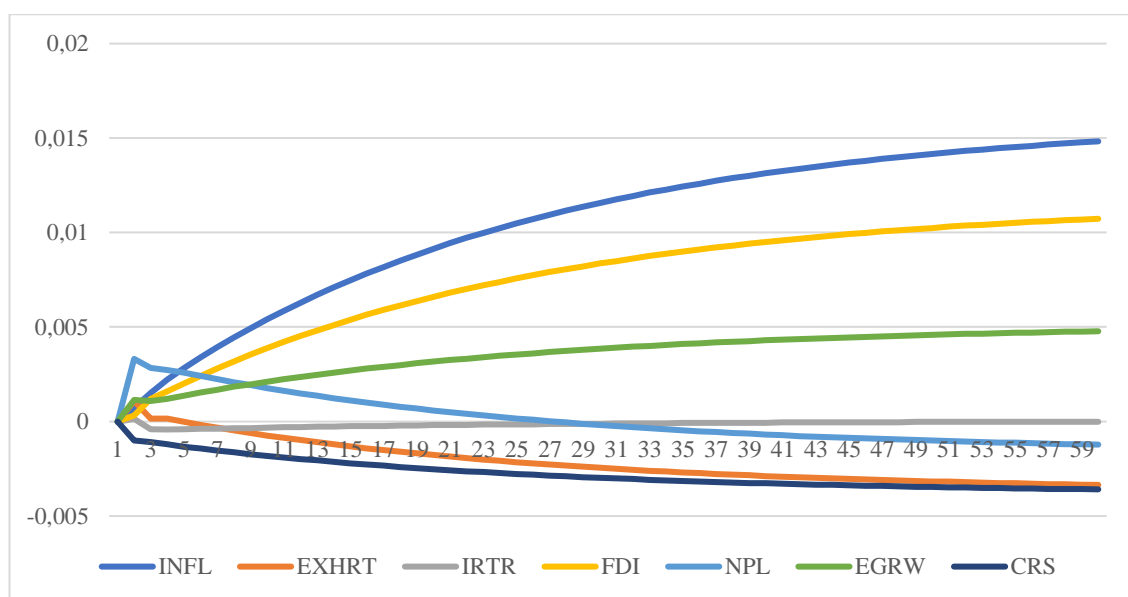


Figure 1. Impulse Response Function

Sources: Data Processed (2024)

The risk analysis demonstrates that the commercial bank credit response to NPL is initially positive but declines over time, meaning it is finite. Therefore, a commercial bank's credit is affected by bad debts, but the response may decline over time. The response of commercial bank credit to bad crisis conditions is also negative in the initial period, but stabilizes with time, meaning that it is finite. Therefore, the crisis conditions affect commercial banks' credit, but the response may stabilize over time.

### ***Forecast Error Variance Decomposition***

The Forecast Error Variance Decomposition (FEVD) results imply a significant portion of the contribution of macroeconomic factors over time to the variability of commercial bank loans. The analysis shows that inflation (INFL), interest rates (IRTR), economic growth (EGRW), and non-performing loans (NPL) establish the trend of variability of commercial bank loans.

Inflation has an evident influence on the variation of commercial bank loans; however, it has a diminishing influence as time goes by. Thus, inflation rate stability is essential in the financial forecasting model and risk management. Similarly, interest rates are significant variability factors in commercial bank loans; however, the influence diminishes over time. The bank and central bank monetary policies must be revisited, possibly every year, to identify such trends and act accordingly to diminish the risks.

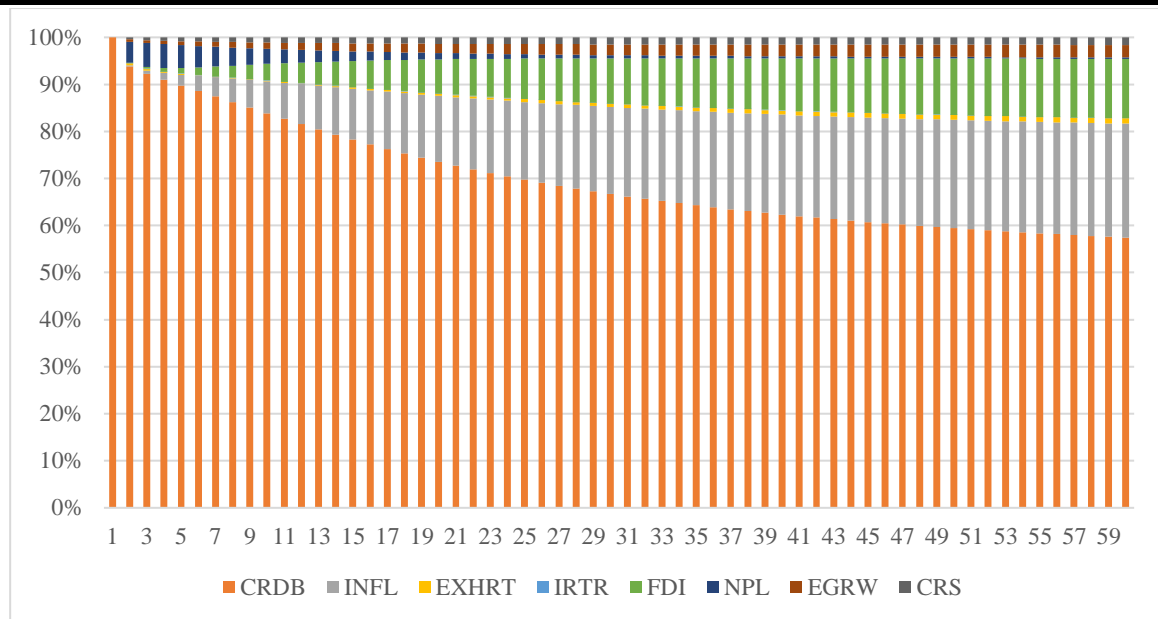


Figure 2. Forecast Error Variance Decomposition

Sources: Data Processed (2024)

Although economic growth positively affects variability, the results suggest that it has little effect. Thus, other factors must be considered to maintain the stability of commercial bank loans. Regarding the level of non-performing loans, bad debts variably affect the overall loan levels; thus, credit risk needs to be managed more effectively to ensure a higher level of stability.

Using the output of the forecast error variance decomposition and the contribution of the various economic variables to the variation of commercial bank loans, the various economic and bank factors can act upon major measures that can be taken to reduce the risk. For example, more effective measures can be devised to deal with inflation and interest rate changes.

## E. CONCLUSION

It is well known that there is a long-term association between foreign investment and non-performing loans, which is considered very convenient for understanding the balance of the variables and their long-term effects on one another. Moreover, it is associated with shocks. As such, examining how each variable reacts to shocks and what the result is can help illustrate the dynamics of the economic system.

Overall, the research findings emphasized the role of each variable in commercial bank credit variability and how it affects it. They show how changes in interest rates, inflation, economic growth, FDI, and NPL influence the level of credit. Such information can be used to

understand the most influential variables in the banking system and what they mean for the degree of credit level. It helps understand the dynamics of the economic system and banking, and thus assists in making informed decisions about economic policies and risks.

This study has several limitations. First, its focus on Indonesia limits the generalizability of the findings to other countries with different economic structures and banking systems. The short period analyzed may only partially capture economic cycles, potentially affecting the observed long-term relationships. The VECM model assumes stable long-term relationships, which may not hold during extreme market conditions. Additionally, this study focuses solely on conventional banks, limiting its applicability to Islamic banks or other financial institutions. Finally, external global factors like geopolitical risks were not fully explored, potentially impacting the dynamics of the variables studied.

Future research should aim to enhance the robustness of its findings by validating the structural stability of the VECM using alternative models and more sophisticated econometric techniques. This would ensure that conclusions are not overly reliant on a single model. Expanding the geographical scope and time frame to include multiple regions and economic cycles would provide a more comprehensive analysis. Incorporating additional variables, such as exchange rates or global economic factors, would offer a broader perspective on what influences commercial bank credit. Investigating the impact of unconventional monetary policies and global shocks could also provide deeper insights.

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