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The Impact of Central Bank Policy Mix on Banking Risk Behavior

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ABSTRACT

Research Originality: The study investigates the impact of a coordinated policy mix on Banking Risk Behavior in creating credit.

Research Objectives: This research aims to determine the effect of the policy mix on lending and the role of risk behavior in Indonesia.

Research Methods: We use the Structural Vector Autoregression (SVAR) estimation technique for data 2012Q1-2021Q3.

Empirical Results: The study found that monetary policy does not affect credit directly through credit interest rates. Monetary policy affects credit indirectly through its ability to influence an internal variable of banks and strengthen it through interaction with macroprudential policies. The study found that deposit and capital determine the amount of credit disbursed. The study results found that the policy mix of monetary and macroprudential policies effectively influenced recognition in Indonesia. Mixed policies reinforce one another.

Implications: To manage bank risk behavior in distributing credit, a mix of monetary and macroprudential policies is needed. When coordinated, both policies reinforce each other and are more effective than when done separately.

Keywords:
monetary policy; macroprudential policy; credit; risk

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INTRODUCTION

Economic development cannot be separated from the existence of lending activities by banks, both credit for individuals and companies (Freixas & Rochet, 2008). Credit has a pro-cyclic nature. When the economy is experiencing expansion, the behavior of investors and banks tends to be optimistic and willing to take more significant risks. Increased credit and asset prices will accompany the courage to take more significant risks. On the other hand, when the economy experiences contraction, the behavior of investors and banks tends to be less optimistic. It tends to avoid risks that result in a reduction in credit. The pro-cyclical nature of credit provides reasons why credit distribution must be managed to deepen the economic cycle.

Previous studies found a relationship between credit and business cycles (Jeong & Jung, 2013; Saini et al., 2021; Yi et al., 2022), and it has become a central bank concern. Central Bank uses interest rates to influence the cycle and financial markets (Taylor, 2009; Mishkin, 2009; Jung, 2015). However, monetary policy with interest rate instruments can only be directed at "leaning" against accumulated risks from financial procyclicality, especially credit expansion. Consequently, even though interest rates can control credit growth, a single monetary policy still cannot overcome the possibility of systemic risks arising from procyclicality. The 2008 Global Financial Crisis, the biggest global crisis after the great depression in 1929-1930 (Shala et al., 2013), provided valuable lessons and made the world agree that using monetary policy alone to maintain economic stability is insufficient. This situation has caused the Central Bank to carry out a policy mix of monetary and macroprudential policies. The policy set influences risk-taking behavior by banks in offering credit that is influenced by internal or external factors. Aiyar et al. (2016) and Robstad (2020) show that internal factors can be in the form of savings and capital, and external factors can be in the form of implemented policies and macro factors such as output gaps, inflation, and exchange rates.

Banks maximize profits by setting higher lending rates than deposit rates. Over a long period, low interest rates increase bank credit and profits but increase bank risk (Rajan, 2005; Paligorova & Jimenez, 2012; Hussain et al., 2021). Furthermore, banks also face risks as financial intermediaries since they collect funds for individuals with excess funds and distribute them back as credit to individuals who need funds. Matthew and Thompson (2008) state that the risks that have the most significant effect from the activities carried out by banks are credit risk and liquidity risk. Furthermore, Kasri and Azzahra (2020) find the positive influence of banking stability and credit growth. There are several ways to find out how interest rate policy affects risk-taking by banks (Bikker & Vervliet, 2018; Hussain et al., 2021; Amalia & Suriani, 2023). First, through the search for yield, where interest rates are set, they tend to be low, which can encourage banks to switch to riskier investments because investments with lower risks tend to have low returns and are not attractive (Rajan, 2005). Second, through the valuation effect, low interest rates affect the value of income, assets, cash flow, and risk measurement. A low-interest rate policy creates a gap between the required return target and the actual yield, which banks try to overcome by taking on excessive risk (Rajan, 2005).

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Banks' behavior in distributing excessive credit can cause instability in the financial system. Matysek-Jedrych (2018) and Sui et al. (2022) state that macroprudential policy is recognized as an essential contributor to maintaining financial system stability. Referring to the IMF survey (2010), Hidayati and Sugiyanto (2019) state that the problems faced by macroprudential policies will be grouped based on problems that might affect financial system stability. One of these problems is credit problems. In dealing with credit problems, several instruments can be used, namely the Loan Value (LTV) Ratio, the Debt to Income (DTI) Ratio, Foreign Currency Lending, and the Ceiling on Credit Growth.

The policy mix implemented by a country's central bank is primarily needed to overcome credit procyclicality and ensure financial system stability is maintained. The policy mix implemented is interpreted as optimal integration between monetary policy and macroprudential policy implemented by the central bank to maintain price stability and Financial System Stability (FSS). In order to support the maintenance of financial system stability, apart from monetary policy, macroprudential policies are needed through the regulation and supervision of financial institutions and focusing on systemic risk mitigation.

Lim et al. (2013), with reference data from 49 countries, found that the macroprudential policies used by the Central Bank have a negative correlation related to the policy response implemented by the Central Bank. Furthermore, the studies conducted by Aiyar et al. (2016) and Chen et al. (2016) found that macroprudential policy can reduce risk behavior from an increase in demand for credit. On the other hand, research by Aiyar et al. (2016) provides an overview of monetary policy, which has a more enormous and significant influence primarily related to bank loan supply. In this case, the influence of monetary policy is found through changes in Capital Requirements that can affect bank loan supply. Research by Chen et al. (2016) using the DSGE framework, which focuses on Sweden, describes how the mix of macroprudential and monetary policies has contributed to maintaining credit distribution, risk behavior, and reducing household debt. Research by Chen et al. (2016) emphasizes that macroprudential policy is better at reducing risk behavior by banks than monetary policy. The study results then show that household debt increases when monetary policy experiences shocks. However, a mix of monetary and macroprudential policies is still needed to maintain bank lending. Several studies have stated that monetary policy is more likely to influence risk-taking decisions by banks (Dajcman, 2016; Hussain et al., 2021).

Subsequent research was put forward by Robstad (2018), who looked for the effect of monetary policy shocks on credit in Norway with reference variables in research using interest rates, inflation, GDP, credit, house prices, and exchange rates. Robstad (2018) found that when there is a shock to monetary policy, banks respond by first increasing lending to individuals or companies, increasing the risks that banks take. Shocks, in this case, will then affect monetary policy easing by the Central Bank as the policy maker. The result aligns with research by Aydinbas et al. (2015) found that when monetary policy experiences shocks, other policies are needed, including macroprudential policy, since macroprudential policy aims to maintain credit distribution and banking risk-taking (Chen & Columba, 2016; De Schryder & Opitz, 2021).

Bank risk-taking can increase in line with customers' increased demand for credit (debtors). The behavior mainly applies to banks that emphasize forward-looking, which tends to increase risk-taking. In addition, a mix of monetary and macroprudential policies has proven to help reduce the possibility of losses due to excessive banking risks (Triandhari et al., 2017). The effectiveness of the policy mix between monetary and macroprudential in reducing the possibility of taking credit risk is reflected when there is the use of LTV or CRR and not only focusing or fixating on interest rates alone (Pan & Zhang, 2020). Pan and Zhang (2020) found effectiveness in reducing risk-taking and lending, assuming a policy mix was needed and not just focusing on a single policy. The policy intended in this research is not to focus on a single monetary policy but to use macroprudential policy to help reduce this risk-taking.

This research has similarities with previous studies because the variables and policy instruments used are the same. Like previous studies, this research uses interest rates as a monetary policy instrument and Loan Value Ratio (LTV) as a macroprudential policy instrument. The difference compared to previous research lies in the specific end goal of the policy on lending through the influence of the policy mix on the role of banking risk-taking behavior. Using the two instruments complements the shortcomings of previous research, which did not explicitly explain how the policy mix influences credit distribution.

Previous studies have found that the use of a mix of monetary and macroprudential policies can influence credit distribution (Lim et al., 2013; Aiyar et al., 2016; Chen et al., 2016; Triandhari et al., 2017; Robstad, 2018; Pan et al., 2020; Sui et al., 2022; Kim & Mehrotra, 2022; Malovaná et al., 2023) more effectively than monetary policy alone. In this study, the policy mix influences credit through its influence on banking risk behavior. Another novelty is that this study uses individual bank data.

This study aims to find the effect of the policy mix of monetary and macroprudential policy on credit. Monetary policy is measured using the Bank Indonesia Interest Rate, and risk-taking behavior is calculated using the Capital Adequacy Ratio (CAR); macroprudential policy is measured using loan-to-value (LTV) and bank internal instruments, including Credit Interest, Capital, Deposit Interest rates, and Savings. Furthermore, macroeconomic factors are measured by Output Gap, inflation, and Exchange Rate. Finally, credit scores are calculated using individual bank credit.

METHODS

This study will use time series data consisting of 59 conventional commercial banks, both government and national private banks in Indonesia, with the period 2012-2021 with quarterly data. The selection of 59 banks as research samples was based on the availability of financial reports. The initial period of the study was in 2012, when Indonesia began to establish macroprudential policies. The final period was completed with the latest LTV regulation with Bank Indonesia Regulation (PBI) Number 23/2/PBI/2021 concerning the Third Amendment to Bank Indonesia Regulation Number 20/8/PBI/2018 concerning

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the Loan to Value Ratio for Property Credit, Financing to Value Ratio for Property Financing, and Down Payment for Motor Vehicle Credit or Financing which was valid from March to December 2021.

This study uses one dependent variable, namely changes in credit (ΔCr), and ten independent variables, which are entirely divided into; two policy instruments, namely Changes in Policy Interest Rates (Δr) and LTV; five bank internal instruments consisting of Capital Adequacy Ratio (CAR), changes in lending rates (Δrc), changes in capital (ΔK), changes in deposit rates (Δrd), changes in total deposits (ΔD), and three variables control (macroeconomic variable) namely output gap ($\hat{y}$), inflation fluctuation ($\hat{\pi}$), and Exchange Rate fluctuation ($\widehat{er}$).

Table 1. Description of Variable

Variable	Sign	Unit	Sources
Inflation fluctuation[a]	$\hat{\pi}$	Percent	BI
Exchange Rate fluctuation[a]	$\widehat{er}$	Billion Rupiah	FX Sauder
Output Gap[a]	$\hat{y}$	Billion Rupiah	Worldbank
Change of policy interest rate[b]	Δr	Percent	BI
Change of deposit interest rate[b]	Δrd	Percent	SPI OJK
Change of Credit interest rate[b]	Δrc	Percent	SPI OJK
Loan to Value	LTV	Index	BI
Capital Adequacy Ratio (CAR)	CAR	Percent	SPI OJK
Change of Capital[b]	ΔK	Billion Rupiah	SPI OJK
Change of Deposit[b]	ΔD	Billion Rupiah	SPI OJK
Change of credit[b]	ΔCr	Billion Rupiah	SPI OJK

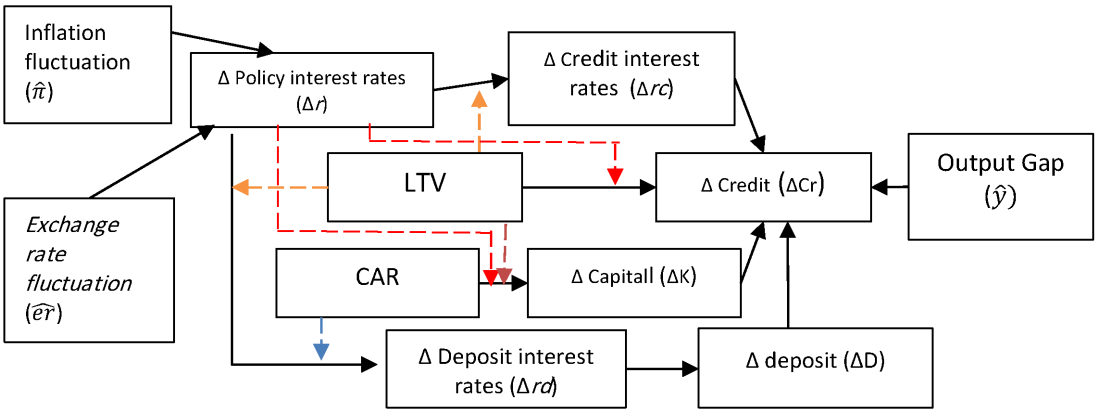
Note: [a] $\frac{x-x^*}{x^*} \times 100\%$, where x is inflation, exchange rate, or real GDP. x^* is the equilibrium value of x that is estimated using the Hodrick Prescott Filter (see Utama et al. 2022: p 100). [b] $x_t - x_{t-1}$, where x is policy interest rate, deposit interest rate, credit interest rate, capital, deposit, or credit.

This study will measure the LTV for macroprudential policy instruments using an index. This macroprudential index refers to research by Altunbas et al. (2018), who used a discrete value of -1 for policies when they were relaxed, a discrete value of 1 when they were tightened, and 0 when there was no change. The higher index indicates a tighter policy. Conversely, when the index value is lower, it suggests that the policy is being loosened. The model used in this study refers to research by Aiyar et al. (2016) and Robstar (2018), who generally examine the response of credit to easing monetary and macroprudential policies. We use the Structural Vector Autoregressive (SVAR), where the number of commercial bank loans is the dependent variable. We divide independent variables into policy, bank characteristics, and macroeconomic variables. The Loan Value Ratio (LTV) is used as a macroprudential variable, and policy interest rates as a monetary variable. We use Capital Adequacy Ratio (CAR), lending rates, bank capital, deposit rates,

and total deposits as bank characteristic variables. Finally, the output gap, inflation, and exchange rate are macroeconomic and control variables. Figure 1 shows the framework of the model.

The value of w is the lag length determined from the optimum lag test. In the conceptual framework, Δr is the change in policy interest rates, LTV is Loan to Value, CAR is the Capital Adequacy Ratio, Δrc is the change in individual bank lending rates, ΔK is the change in bank capital, Δrd is the change in interest rates individual bank deposits, ΔD is the change in individual bank deposits, $\hat{y}$ is the output gap, $\hat{\pi}$ is inflation fluctuation, $\widehat{er}$ is exchange rate fluctuation, and Cr is the change in individual bank credit.

Figure 1. The Model Framework



In the policy interest rate model, monetary instruments and LTV as macroprudential policy instruments affect bank internal factors, reflected in lending rates, capital, deposit rates, and total deposits. Other external factors besides bank policies and internal factors include the output gap, inflation fluctuations, and exchange rate fluctuations. The CAR of the bank also affects its capital. Finally, there is the influence of policy interaction on bank behavior in extending credit.

Rajan (2005) and Borio and Zhu (2008) state that using an easing monetary policy can increase interest on deposits, bank deposits, and credit interest, and then demand for credit will increase. The model also shows the effect of the interaction of monetary and macroprudential policies on bank decisions to extend credit. The monetary and macroprudential policies in this study show how the two policies' processes are simultaneously used to influence bank decisions in extending credit. In addition, there is an output gap as a macro variable that can directly influence banks' decision to extend credit. Meanwhile, inflation and the exchange rate affect the determination of the policy interest rate as stated by the Taylor Rule. However, the bank previously considered some risks when extending more or less credit. The use of this variable is in line with research by Aiyar et al. (2016) and Robstad (2018), which show that monetary, macroprudential policies and bank characteristics influence bank lending decisions.

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SVAR imposes restrictions indicating how certain variables will behave. This restriction in the SVAR model is then developed using an economic theoretical framework and empirical assumptions and can be tested using the Granger Causality Test (Insukindro & Pritadrajati, 2019). Lütkepohl & Krätzig (2004) stated that VAR innovation is orthogonalized using the Cholesky decomposition of the covariance matrix, a recursive structure that can be imposed on the relationship between variables. The order in which the variables in the model are arranged can be seen in how the variables are placed in the time series vector Y_t.

We need to carry out several steps to find effective SVAR. The steps start with the stationarity test, determining the lag length, establishing the SVAR model, model stability testing, innovation accounting (Impulse Response Function), and Forecast Error Variance Decomposition. (FEVD). In addition, determining the optimal lag is also one of the essential procedures that must be carried out in model building (Lütkepohl & Krätzig, 2004). After carrying out the lag test, the White Noise Residual test was carried out as a suitability test of the estimated VAR model. The next step is to conduct a VAR stability test. The model is stable if all roots are in the unit circle or can be interpreted as an absolute unit root value of less than 1.

RESULTS AND DISCUSSION

The first step before processing is to test the stationarity of the data using the Levin, Lin & Chu (LLC), Breitung (B), Im, Pesaran and Shin (IPS), Augmented Dickey Fuller-Fisher (ADFF) and Phillips Perron- Fisher (PPF) tests. The stationarity test results are shown in Table 2. Table 2 shows that all variables are stationary. The test statistical value is greater than the critical value and the P-Value is smaller than alpha (α) 5 percent.

Furthermore, the optimum lag length was determined before the researchers estimated the SVAR model. If the optimum lag length is too short, the model can only partially explain the model's dynamics. However, if the lag is too long, it will prevent efficient estimation due to reduced degrees of freedom. Table 5 shows that the optimum lag is at lag 3, indicated by the values on the Likelihood Ratio (LR), Final Predictor Error (FPE), Akaike Information Criterion (AIC), Schwartz Criterion (SC), and Hannan-Quinn Information Criterion (HQ)) so that in the estimation step the next stage uses lag three as the optimum lag.

The next test is the stability test of the VAR system, which is needed to ensure that the estimation results have high validity. This stability test uses a stability condition check known as the inverse roots of AR polynomial characteristic. This condition shows when each variable is multiplied by the number of lags of each variable. The VAR system is said to have high stability if the roots of characteristic polynomials have a modulus of not more than one and all are inside the unit circle. In this case, if most of the modulus is inside the circle, then the model is stable. Figure 2. shows that all inverse roots are inside the unit circle, so it can be concluded that the SVAR model is stable. All values below one.

Table 2. Stationarity Test

		LLC t*.	Breitung t-stat	IPS W-stat	ADF -Fisher Chi-square	PP - Fisher Chi-square
$\hat{\pi}$	Stat.	5.757	-6.430***	-5.586***	183.292***	395.436***
	(P-Value)	(1.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\widehat{er}$		-11.084***	-13.697***	-5.361***	178.562***	284.216***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\hat{y}$		-30.268***	-31.056***	-22.115***	651.457***	1302.450***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δr		-13.545***	-18.156***	-6.208***	196.872***	558.516***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δrd		-11.963***	-20.832***	-13.523***	382.852***	472.249***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δrc		-9.388***	-9.175***	-0.545***	92.436***	466.562***
		(0.000)	(0.000)	(0.293)	(0.961)	(0.000)
LTV		-24.916***	-16.087***	-23.470***	697.213***	1508.630***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAR		-27.897***	-30.384***	-19.076***	551.776***	1146.120***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔK		-20.996***	-20.688***	-14.918***	363.608***	769.005***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔD		-13.471***	-7.095***	-19.405***	586.759***	3505.690***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ΔCr		-6.877***	-3.598***	-12.635***	408.275***	2209.410***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: ***stationer at α=0.01; Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 2. Lag optimum test

Lag	Log	LR	FPE	AIC	SC	HQ
0	-82938,14	NA	1,07e+34	95,3798	95,6621	95,4842
1	-81951,62	1949,241	3,58e+33	94,2879	94,6832	94,4340
2	-81267,58	1346,866	1,70e+33	93,5434	94,0517	94,7313
3	-80723,87	1066,806*	9,49e+32*	92,9602*	94,5814*	93,1899*

Note: *lag optimum

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Figure 2. Stability Test of Vector Autoregression (VAR) System

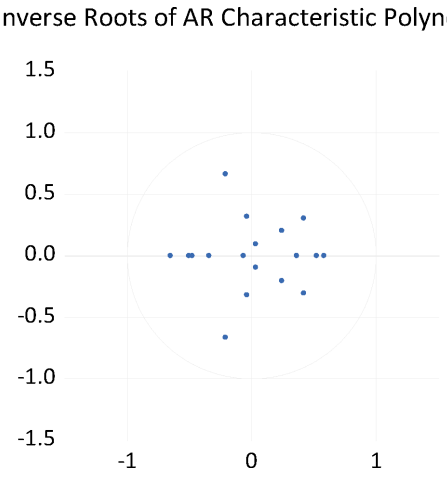

Table 6. shows the results of the SVAR estimation of the equations used in this study. The SVAR estimation results summarized in Figure 3 show that the monetary authority reacts to inflation and the exchange rate. If inflation is higher than expectations (inflation trend or inflation expectations), then interest rates are raised. Likewise, if the exchange rate, Rp/USD, is higher than expected or the Rupiah depreciates, the monetary authority will raise the policy interest rate. These estimated results confirm the central bank's objective of maintaining the currency's value internally and externally, its value against goods and services, and its value against foreign currencies.

Table 3. Estimation Result of SVAR

	Dependent Variable					
Independent variable	Δr_{it}	Δrc_{it}	Δrd_{it}	$\Delta \mathrm{K}_{it}$	$\Delta \mathrm{D}_{it}$	$\Delta \mathrm{Cr}_{it}$
Δr_{it-1}	0.3312***	0.6139***	6.9273***			
	[13.2375]	[4.8986]	[13.5382]			
Δr_{it-2}	.154678***	-1.1952***	0.3733			
	[5.9691]	[-7.2932]	[0.6214]			
Δr_{it-3}	-0.1347***	-1.6498***	-1.5809***			
	[-6.7517]	[-12.4878]	[-3.1695]			
Δrc_{it-1}		0.2888***				-1116197
		[13.2537]				[-0.3283]
Δrc_{it-2}		0.4052***				23480.85
		[24.3354]				[0.0099]
Δrc_{it-3}		-0.1370***				411261.1
		[-8.7671]				[0.1472]
Δrd_{it-1}			0.0988***		684138***	
			[3.8592]		[3.0119]	

	Dependent Variable					
Independent variable	Δr_{it}	Δrc_{it}	Δrd_{it}	$\Delta \mathrm{K}_{it}$	$\Delta \mathrm{D}_{it}$	$\Delta \mathrm{Cr}_{it}$
Δrd_{it-2}			-0.2659***		-402957	
			[-9.5812]		[-1.5815]	
Δrd_{it-3}			0.2525***		411074.4	
			[8.4934]		[1.6688]	
$\Delta \mathrm{K}_{it-1}$				-0.0048		0.8697*
				[-0.2718]		[1.6827]
$\Delta \mathrm{K}_{it-2}$				-0.0055		0.4114
				[-0.3088]		[0.7820]
$\Delta \mathrm{K}_{it-3}$				-0.0006		-0.1236
				[-0.0363]		[-0.2316]
$\Delta \mathrm{D}_{it-1}$					0.0033	0.2972***
					[0.1427]	[3.8724]
$\Delta \mathrm{D}_{it-2}$					0.1313***	0.3721***
					[5.4865]	[4.7403]
$\Delta \mathrm{D}_{it-3}$					-0.0478*	0.2970***
					[-1.9405]	[3.6775]
LTV_{it}						-1743313.
						[-1,5561]
CAR_{it}				1721,6***		
				[3,0393]		
$\hat{\pi}_{it}$	0,0025***					
	[8,5798]					
$\widehat{er}_{it}$	0,006***					
	[4,1752]					
$\hat{y}_{it}$						-136,87***
						[-2,1384]
$\Delta r_{it-1} LTV_{it-1}$		-0,7264***	-5,0845***			27813688
		[-3,734]	[-6,5977]			[1,5707]
$\Delta r_{it-2} LTV_{it-2}$		2,8434***	-4,7385***			46585495***
		[11,2433]	[-5,2227]			[2,9169]
$\Delta r_{it-3} LTV_{it-3}$		0,9532***	-2,2444***			-1489648.
		[5,2501]	[-3,6989]			[-0,14612]

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Independent variable	Dependent Variable					
	Δr_{it}	Δrc_{it}	Δrd_{it}	$\Delta \mathrm{K}_{it}$	$\Delta \mathrm{D}_{it}$	$\Delta \mathrm{Cr}_{it}$
$\Delta r_{it-1} CAR_{it-1}$		-0,0204***	-0,2831***	3308,813*		
		[-3,6788]	[-12,3951]	[1,8490]		
$\Delta r_{it-2} CAR_{it-2}$		0,0475***	-0,0005	-4834,1***		
		[6,5927]	[-0,0205]	[-2,3424]		
$\Delta r_{it-3} CAR_{it-3}$		0,0791***	0,0879***	1203,830		
		[13,3894]	[3,9351]	[0,8273]		
$\Delta r_{it-1} LTV_{it-1}$		0,0436***	0,2243***	-4907,9		-1400798.
CAR_{it-1}		[4,5531]	[6,0644]	[-1,6699]		[-1,5415]
$\Delta r_{it-2} LTV_{it-2}$		-0,1363***	0,2809***	4572,612		-2645152***
CAR_{it-3}		[-11,1626]	[6,5109]	[1,5779]		[-3,1920]
$\Delta r_{it-3} LTV_{it-3}$		-0,0336***	0,1189***	-1041,82		93713,64
CAR_{it-3}		[-3,9760]	[4,2619]	[-0,6259]		[0,1935]

Note: *** significant at α = 1%; ** significant at α = 5%; * significant at α = 10%

Banks responded to the increase in policy interest rates by raising deposit and credit rates in the first quarter. However, the bank will adjust in the second and third quarters by lowering lending and deposit rates. The interaction between monetary policy and LTV produces interesting results; in the first quarter, the interaction has a negative effect, and the next is positive. The estimation results show that LTV is beneficial in extending the impact of monetary policy on lending rates. In contrast, the interaction policy of monetary policy and LTV has a negative sign. These results weaken the effect of monetary policy on deposit rates. The result confirm that LTV can be used to control credit.

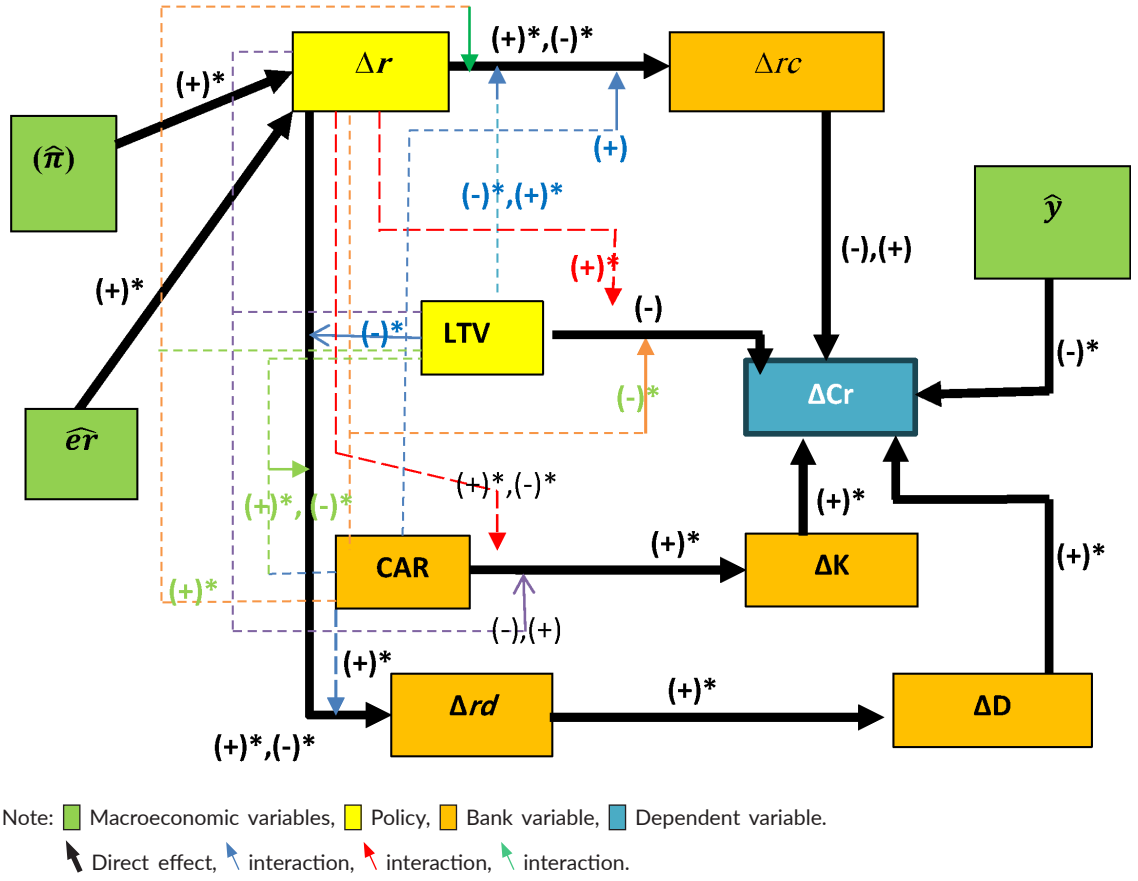
Furthermore, the policy interest rate and CAR interaction show a significant positive direction. These results indicate that the interaction of monetary policy and CAR strengthens the policy interest rate's influence on banks' determination of deposit and lending rates. Furthermore, exchanging the three policy variables strengthens monetary policy's influence on deposit and lending rates. This finding is in line with Robstad (2018), who found that changes in policy interest rates affect changes in lending and deposit rates.

The estimation results show that LTV directly affects changes in credit negatively, although not significant. However, the interaction of LTV and monetary policy reduces the effect of LTV on credit. Meanwhile, the interaction between monetary policy and CAR increases the effectiveness of LTV in influencing recognition. The results show that tightening macroprudential policy instruments reduces credit growth after interacting with monetary policy and CAR. The results align with the research of Zhang and

Tressel (2017), who found that tightening macroprudential policies will reduce credit growth.

The results showed that CAR has a positive effect on capital. When there is a movement in the CAR value, it can affect movements in the capital value. The result aligns with the theory whereby the capital adequacy ratio can indicate the extent of a bank's readiness to take risks. When the CAR value is higher (reference > 8%), the bank can face the risks arising from the loans distributed. In addition, capital is one of the investments provided by bank owners as operational costs; when there is a change in the value of the capital adequacy ratio, it is difficult for the bank to finance operational activities and contribute to profit through credit. Therefore, when the value of the capital adequacy ratio is higher, it is more likely that the bank is ready to face risks, allowing it to finance operations and contribute to providing a profit. The estimation results also show that monetary policy strengthens the effect of CAR on bank capital in the short term (one quarter) but not in the longer term.

Figure 3. Estimation Result



Note: Macroeconomic variables, Policy, Bank variable, Dependent variable.
Direct effect, interaction, interaction, interaction.

Furthermore, the estimation results show that an increase in interest rates on savings causes an increase in savings. The estimation results show that the amount

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of savings and bank capital significantly influences the amount of credit. Meanwhile, credit interest rates do not significantly affect the amount of credit. The results of this study show that it is difficult for monetary policy to influence credit through the credit interest rate channel directly but must interact with other policies, especially macroprudential policies. The results confirm the findings of previous studies (Lim et al., 2013; Aiyar et al., 2016; Chen et al., 2016; Triandhari et al., 2017; Robstad, 2018; Pan et al., 2020; Sui et al., 2022; Kim & Mehrotra, 2022; Malovaná et al., 2023) which state that a mix of macroprudential and monetary policies is needed in controlling credit.

CONCLUSION

The results of this study indicate the importance of a policy mix and monetary and macroprudential policies in influencing banking behavior in distributing credit. Monetary and macroprudential policies have been shown to reinforce each other in controlling credit. Monetary policy has been shown to indirectly influence credit through efforts to influence credit interest rates. However, monetary policy plays a significant role in influencing credit through its influence on capital and savings and its interaction with macroprudential policies. This study also found that monetary and macroprudential policies can influence banking risk behavior. With the influence of the policy mix on banking risk behavior, credit can be controlled.

This study provides additional contributions by finding that monetary and macroprudential policies can reinforce each other. Policies' impact on bank behavior also determines the amount of credit disbursed. Furthermore, this study recommends that Bank Indonesia use both policies to strengthen its ability to control credit. In addition, macroprudential policies have more instruments, other than LTV, that can be used so that the mix of monetary and macroprudential policies can be more diverse and applied as needed.

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