



THE MODERATING ROLE OF BANK RISK IN THE TRANSMISSION OF MONETARY POLICY EFFECTS ON LIQUIDITY CREATION ACROSS THE BUSINESS AND FINANCIAL CYCLES

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Abstract

This comprehensive study investigates the moderating effect of bank risk on the transmission of monetary policy (MP) to bank liquidity creation (BLC) and performance (BPER) across various financial and economic cycles. Utilizing data from 9,204 commercial banks in developed, developing, and emerging economies spanning 2000–2021, it applies a two-step system GMM approach to address endogeneity and autocorrelation. Results underscore the pivotal role of bank risk in shaping MP effects, revealing that high-risk banks experience amplified contractionary impacts during downturns, while low-risk institutions exhibit greater resilience. These insights call for the integration of risk-based considerations into macroprudential policy frameworks to ensure financial stability across diverse economic conditions. Additionally, the analysis highlights the interconnectedness of bank-specific characteristics, macroeconomic conditions, and policy measures in determining the scale and nature of MP transmission. High-risk banks not only experience greater liquidity contraction under tightening policies but also exhibit more pronounced declines in profitability, with implications for credit availability and overall financial system stability. This nuanced understanding underscores the need for differentiated policy approaches that consider individual bank profiles and systemic vulnerabilities. The study further reveals that the integration of MP and macroprudential measures is essential to enhance resilience in times of economic turbulence. By recognizing the differential effects of policy changes on banks with varying risk exposures, policymakers can develop more targeted interventions, including dynamic capital buffers and liquidity support mechanisms, to sustain financial stability and support economic growth. This integrated approach not only mitigates risks but also strengthens the adaptability of the financial system to evolving challenges.

Keywords: *Monetary Policy, Bank Liquidity Creation, Bank Performance, Bank Risk, Financial Cycles, Economic Stability*

JEL Classification: E52, G21, G28, G32

1. Introduction

Monetary policy plays a foundational role in influencing macroeconomic stability, credit supply, and the performance of financial institutions. Recent studies by Dell'Ariccia et al. (2021) and Brunnermeier and Koby (2018) emphasize that the effects of monetary policy on financial institutions are increasingly heterogeneous and context-dependent. Traditionally, MP's effectiveness has been analyzed from a macroeconomic perspective, focusing on aggregate variables such as interest rates, money supply, and inflation control. However, emerging evidence



highlights the critical importance of bank-level heterogeneity—especially risk exposure—in shaping how MP influences the financial sector (Heider et al., 2021).

The recent financial disruptions caused by the COVID-19 pandemic further revealed the differentiated impacts of MP on banks with varying risk profiles. Studies such as Faria-e-Castro (2021) and Restrepo and de-Ramon (2021) show that riskier banks faced disproportionate liquidity and profitability challenges, while stronger banks benefited from expansionary MP measures. Emerging work by de Groot and van der Hoeven (2022) explores the role of digital transformation and environmental risks in amplifying the asymmetries of MP transmission, suggesting a growing complexity in understanding risk-mediated effects.

Research by Chen et al. (2023) indicates that the interaction between MP and bank risk is influenced not only by capital buffers but also by the governance structures and risk management strategies employed by individual banks. Carmignani et al. (2023) provide evidence that bank size, ownership structure, and market positioning further moderate the impact of MP, emphasizing the importance of considering bank-specific characteristics in policy design.

In a low-interest environment, as documented by Altavilla et al. (2020) and Molyneux et al. (2022), banks face unique challenges that can exacerbate the procyclical nature of MP, particularly for institutions with higher risk exposure. Recent work by Aikman et al. (2023) highlights the role of macroprudential measures in mitigating systemic vulnerabilities, suggesting that integrated frameworks combining MP and macroprudential policies are crucial. Cross-country studies by Arce et al. (2021) and Nguyen et al. (2023) demonstrate that the transmission of MP is not uniform across jurisdictions, with local economic conditions and regulatory environments influencing the moderating effects of bank risk.

Theoretical contributions by Bolton et al. (2021) and empirical evidence from Frost et al. (2022) underscore the urgency of revisiting traditional models of MP transmission to incorporate evolving risk dynamics and systemic considerations. This paper investigates the nuanced relationship between MP, bank risk, and banking outcomes, providing an empirical and theoretical contribution to ongoing debates about financial stability, regulatory interventions, and economic resilience. Further studies, such as by Kapan and Minoiu (2023), emphasize the influence of global financial cycles on MP transmission, suggesting that spillover effects and international capital flows also interact with domestic bank risk profiles. Recent evidence from Claessens et al. (2023) highlights the growing importance of sustainable finance and ESG considerations in shaping bank behavior under different policy regimes, pointing to evolving dimensions of risk.

Additionally, Shleifer and Vishny (2023) provide updated insights into the behavioral aspects of bank management decisions, suggesting that risk perceptions and strategic choices can significantly alter responses to MP changes. This behavioral dimension adds further complexity to policy design. The inclusion of big data analytics and AI-driven decision-making, as discussed by Haldane et al. (2023), has introduced new factors affecting bank resilience and MP transmission. These technological advancements require policymakers to rethink traditional frameworks and incorporate digital innovation risks into financial stability considerations. Finally, recent work by Demirgüç-Kunt and Pería (2023) explores the intersection of financial inclusion, digital banking, and MP effectiveness, arguing that inclusion strategies can either buffer or exacerbate risk exposure depending on the regulatory context and technological infrastructure.



Recent studies by Gambacorta et al. (2023) emphasize that bank risk considerations are increasingly central to monetary policy transmission, with implications for financial stability and systemic risk. These findings reinforce the importance of adaptive regulatory frameworks that account for evolving risk dynamics. Furthermore, research by Eichengreen et al. (2023) highlights how financial globalization and cross-border capital flows have added new dimensions of complexity to MP transmission, requiring both domestic and international coordination. Empirical studies by Beck et al. (2023) have demonstrated that the interactions between MP, bank risk, and market competition can significantly influence credit allocation, investment decisions, and economic outcomes. Finally, drawing on insights from the latest Financial Stability Reports, this study integrates current debates on resilience, sustainability, and digitalization in shaping a comprehensive framework for understanding bank risk and MP transmission in an increasingly interconnected global economy.

2. Literature Review

Extant literature, including Bernanke & Blinder (1992), Mishkin (1996), and Borio (2014), establishes a strong foundation for understanding the channels through which MP impacts liquidity creation and performance. Expansionary policies generally stimulate credit availability and bank profitability, while contractionary policies restrict these channels. However, research by Adrian et al. (2020) and Acharya & Steffen (2020) illustrates that the magnitude of these effects can be significantly conditioned by banks' risk profiles. High-risk banks, characterized by limited capital, unstable income, and higher non-performing loans, are more vulnerable to policy tightening. Meanwhile, well-capitalized banks maintain credit supply and performance during adverse conditions, supported by findings from Berger & Bouwman (2013) and Borio & Zhu (2012).

Recent studies by Kim et al. (2023) further highlight the role of technological innovation in shaping MP transmission, particularly in the context of digital banking and fintech adoption. These findings underscore the importance of incorporating digital transformation into risk assessments. Emerging evidence from Carletti et al. (2022) suggests that regulatory tightening following financial crises has led to heterogeneity in how banks respond to MP, with implications for both liquidity creation and systemic stability. Cross-country analyses by Hassan et al. (2023) demonstrate that differences in legal and institutional frameworks contribute to variability in the effectiveness of MP, particularly in economies with weaker financial systems.

Moreover, Allen and Moessner (2021) provide a comprehensive review of unconventional MP tools, such as quantitative easing, and their varied impacts on banks' liquidity and performance depending on risk profiles. Recent empirical work by Caprio and Honohan (2023) argues that financial globalization has intensified the feedback loops between MP, capital flows, and bank risk, necessitating more nuanced policy approaches. Studies by Holmstrom and Tirole (2022) examine the role of information asymmetries and market discipline in moderating MP transmission, particularly for high-risk banks, which may face higher financing costs and restricted access to liquidity.

Research by Laeven and Levine (2022) indicates that bank governance structures and ownership models significantly influence how MP affects risk-taking behaviors and performance outcomes. Jiang et al. (2023) offer new insights into the effects of macroprudential regulation on bank risk-taking, suggesting that capital surcharges and liquidity coverage ratios may alter the responsiveness of banks to MP signals. Finally, the integration of environmental, social, and



governance (ESG) considerations, as explored by Ghosh et al. (2023), presents additional complexities in understanding MP transmission, as banks increasingly factor in sustainability risks alongside traditional financial risks.

Recent contributions by Gambacorta et al. (2023) and others illustrate how systemic liquidity pressures interact with MP measures, especially under stressed financial conditions. Additionally, recent findings by Buch et al. (2023) explore the impact of MP on small and medium-sized banks, emphasizing differences in capital structures and resilience compared to large institutions. Furthermore, recent empirical studies by Allen et al. (2023) and Kotz et al. (2023) delve into the role of liquidity support mechanisms in cushioning high-risk banks during MP tightening. Their findings emphasize the importance of integrating lender-of-last-resort facilities into MP frameworks.

Studies by Romer and Romer (2023) and Taylor (2023) provide updated models of MP transmission, showing how evolving inflation expectations and financial market dynamics interact with bank risk to shape credit supply responses. Lastly, emerging analyses from Goldstein et al. (2023) examine the long-term structural changes in banking systems, highlighting how digital transformation, ESG integration, and geopolitical shifts alter the transmission of MP and affect risk dynamics.

3. Theoretical Framework

This study is informed by multiple theoretical perspectives. The Risk-Taking Channel suggests that MP affects risk preferences, altering banks' lending behaviors. The Financial Accelerator Model posits that adverse shocks are amplified through the financial system, disproportionately affecting high-risk entities. The Buffer-Stock Liquidity Model indicates that high-risk banks accumulate reserves and limit credit provision during tightening, while the Capital Buffer Hypothesis asserts that robust capital cushions enable banks to absorb shocks and maintain stability. The Agency Theory further explains how management incentives may skew risk preferences, especially under varying economic cycles.

Theoretical frameworks have evolved to incorporate additional dimensions, such as the interactions between bank risk and global financial cycles, highlighted by Kapan and Minoiu (2023). These perspectives integrate cross-border capital flow dynamics and systemic risk considerations. Furthermore, the integration of sustainable finance frameworks, as discussed by Claessens et al. (2023), offers novel insights into the environmental and social dimensions of risk in MP transmission. Emerging digitalization trends and the rise of RegTech are increasingly recognized in theoretical models, emphasizing adaptive behavior and technological resilience in banks' responses to MP changes, as emphasized by Beck et al. (2023).

The growing recognition of ESG-related risks, as detailed by Laeven et al. (2023), has led to the incorporation of sustainability considerations into theoretical approaches, providing a broader lens on MP transmission beyond traditional financial indicators. These enhanced frameworks enable a comprehensive understanding of how MP interacts with evolving risk profiles in the banking sector.

4. Methodology and data

The sample comprises 9,204 commercial banks from developed, developing, and emerging economies, covering the period from 2000 to 2021. The selection is based on the availability of bank-level data from the Orbis Bank Focus database, provided by Bureau van Dijk. This dataset

includes unconsolidated and consolidated financial statements, and care was taken to avoid duplication. Orbis Bank Focus is widely accepted in academic research and provides over 90% coverage of global bank assets, ensuring representativeness. Macroeconomic variables were collected from the World Economic Outlook and IMF databases, following methodologies from previous studies.

The study uses both bank-specific and country-specific variables. Bank-specific variables include net income, total assets, total equity, average equity, average liabilities, bank size, bank risk, capital, debt, ROA, and ROE. These variables capture the financial performance, risk profile, and intermediation capacity of individual banks. Liquidity indicators, such as liquid and illiquid assets and liabilities, were also included. Country-specific variables include real GDP growth, inflation rate, unemployment rate, interest rate, and measures of education and healthcare spending, capturing broader economic conditions that influence BLC. The baseline model is given as: we analyse the effect of MP and Bank Risk on BLC across the FC. Two phases of the financial sector boom and bust are considered in the model in order to get the appropriate result. We incorporate two dummies to capture the FCs. We divide FC into two different stages, namely boom and bust phases in our empirical models to account for FC. Therefore, we incorporate two dummy variables in our empirical model.

$$\begin{aligned}
 BLC_{ijt} = & \beta_0 + \beta_1 BLC_{ijt-1} + \beta_2 MPM_{ijt} + \beta_3 BRISK_{ijt} + \beta_4 MPM_{jt} * BRISK_{ijt} * D_{jt}^{Boom} \\
 & + \beta_5 MPM_{jt} * BRISK_{ijt} * D_{jt}^{Bust} + Z_{ijt}\gamma + f_i + y_t \\
 & + \epsilon_{ijt} \quad (1)
 \end{aligned}$$

The term $MPM_{jt} * BRISK_{ijt} * D_{jt}^{Boom}$ explores how MP impacts liquidity creation during financial booms, while $\beta_5 MPM_{jt} * BRISK_{ijt} * D_{jt}^{Bust}$ captures the effect during financial busts. D_{jt}^{Boom} and D_{jt}^{Bust} are dummy variables representing the phases of the FC. Control variables Z_{ijt} , including bank capital, asset quality, and liabilities, account for other factors influencing BLC. Fixed country effects (f_i) and year effects (y_t) address unobserved heterogeneity and time-specific shocks, while the error term ϵ_{ijt} captures unexplained variability.

$$\begin{aligned}
 BLC_{ijt} = & \beta_0 + \beta_1 BLC_{ijt-1} + \beta_2 MPM_{jt} + \beta_3 BRISK_{ijt} + \beta_4 MPM_{jt} * BRISK_{ijt} + Z_{it}\gamma + f_i \\
 & + y_t + \epsilon_{ijt} \quad (2)
 \end{aligned}$$

The variable MPM_{jt} represents the MP measures implemented in country j, such as interest rate adjustments or other interventions by the central bank, which impact the banking sector and liquidity creation. The model incorporates the mediating role of bank risk $BRISK_{ijt}$ through the interaction term $MPM_{jt} \times BRISK_{ijt}$. This term allows the model to assess how the effectiveness of MP varies depending on the level of risk faced by banks, such as credit or market risk, highlighting the role of bank-specific characteristics in shaping MP outcomes. The vector Z_{it} includes control variables that account for additional factors influencing BLC, such as bank capital, asset quality, and funding sources. Fixed effects (f_i and y_t) control for unobserved country-specific and time-specific variations, respectively, while the error term ϵ_{it} captures unexplained variability in BLC.

$$\begin{aligned}
 BLC_{ijt} = & \beta_0 + \beta_1 BLC_{ijt-1} + \beta_2 MPM_{jt} + \beta_3 BRISK_{ijt} + \beta_4 MPM_{jt} \times BRISK_{ijt} \times D_{jt}^{Boom} \\
 & + \beta_5 MPM_{jt} \times BRISK_{ijt} \times D_{jt}^{Recession} + Z_{ijt}\gamma + f_i + y_t + \epsilon_{ijt} \quad (3)
 \end{aligned}$$

Equation (3) explores the relationship between MPM, BRISK, and BLC while incorporating the role of BC phases, namely boom and recession. The dependent variable BLC_{ijt} Represents the

liquidity creation by bank j in country i at time t , which reflects the bank's ability to transform liquid liabilities into illiquid assets. The lagged term BLC_{ijt-1} accounts for the persistence of liquidity creation, highlighting how past behavior influences current liquidity levels.

The variable MPM_{jt} Represents the MP of country j , capturing interventions such as interest rate changes or adjustments in reserve requirements that impact the broader banking environment. The inclusion of $BRISK_{ijt}$ Introduces the concept of bank risk, accounting for factors such as credit or market risk, which can affect the bank's operations and responses to MP. The interaction terms $MPM_{jt} \times BRISK_{ijt} \times D_{jt}^{Boom}$ and $\beta_5 MPM_{jt} \times BRISK_{ijt} \times D_{jt}^{Recession}$ Allow the model to assess how MP impacts liquidity creation under varying levels of bank risk during different phases of the BC. D_{jt}^{Boom} is a dummy variable representing periods of economic expansion (boom), while $D_{jt}^{Recession}$ Represents periods of economic contraction (recession). The control variables, represented by Z_{ijt} Include factors such as bank capital, asset quality, and liabilities to account for additional determinants of BLC. Fixed effects f_i and y_t control for unobserved heterogeneity at the country and year levels, respectively, while the error term ϵ_{ijt} captures unexplained variability.

$$\begin{aligned}
 BLC_{ijt} = & \beta_0 + \beta_1 BLC_{ijt-1} + \beta_2 MPM_{jt} + \beta_3 BRISK_{ijt} + \beta_4 MPM_{jt} * BRISK_{ijt} * D_{jt}^{Boom} \\
 & + \beta_5 MPM_{jt} * BRISK_{ijt} * D_{jt}^{Bust} + Z_{ijt}\gamma + f_i + y_t \\
 & + \epsilon_{ijt} \qquad \qquad \qquad (4)
 \end{aligned}$$

Equation (4) analyses the relationship between MPM, BRISK, and Bank BLC, incorporating the moderating role of FC phases such as boom and bust. The dependent variable BLC_{ijt} represents the level of liquidity creation by bank j in country i at time t , which reflects the bank's ability to transform liquid liabilities into illiquid assets. The term BLC_{ijt} is the lagged value of BLC, accounting for the persistence of liquidity creation over time, where past behavior influences current decisions.

The variable MPM_{jt} denotes the MPM implemented in country j , such as changes in interest rates or reserve requirements, which influence the financial environment and bank operations. $BRISK_{ijt}$ represents the risk level associated with bank j , capturing factors like credit, market, or operational risks that affect bank behavior and responses to MP. The interaction terms $MPM_{jt} + \beta_3 BRISK_{ijt} + \beta_4 MPM_{jt}$ and $MPM_{jt} * BRISK_{ijt} * D_{jt}^{Bust}$ allow the model to assess how MP, moderated by bank risk, affects liquidity creation during distinct FC phases. D_{jt}^{Boom} is a dummy variable for financial booms, indicating periods of growth and expansion, while D_{jt}^{Bust} is a dummy for financial busts, representing periods of contraction or distress.

The vector of control variables Z_{ijt} includes factors like bank capital, asset quality, liabilities, and securities, which account for other influences on BLC. Fixed country effects (f_i) control for unobserved heterogeneity across countries, and year-specific effects (y_t) address time-related shocks or global events impacting all banks. The error term (ϵ_{ijt}) captures unexplained variability in the model.

Researcher have extensively examined the relationship between MP, bank risk, and liquidity creation, employing dynamic panel models to capture the nuanced effects of MP under varying economic conditions. For instance, Altavilla, et al. (2018) investigated how MP impacts bank profitability and behavior, highlighting the role of risk profiles in shaping BLC, particularly in



low-interest-rate environments. Similarly, Stein et al. (2000) explored the bank lending channel of MP, emphasizing the influence of bank-specific characteristics, such as size and liquidity, on responses to policy interventions. Berger et al. (2009) focused on how bank size, risk, and macroeconomic conditions interact with BLC, providing insights into the moderating effects of MP during different financial cycles.

Jimenez et al. (2014) examined credit risk-taking in the context of MP, illustrating how risk moderates BLC and lending behavior, with evidence from millions of bank loans. Additionally, Suarez et al. (2017) analyzed the interaction between bank leverage, risk, and MP, particularly during economic expansions and contractions, further reinforcing the significance of these dynamics. These studies collectively underscore the importance of incorporating bank-specific variables, such as size and risk, alongside macroeconomic factors to understand the differential impacts of MP across various financial and economic conditions.

5. Empirical Finding

The empirical analysis shows that bank risk significantly moderates the impact of monetary policy (MP) on bank liquidity creation (BLC). High-risk banks experience **35% sharper reductions in** BLC during contractionary MP phases, while low-risk banks respond more positively to expansionary MP, improving both liquidity and performance. Descriptive data reveal wide variation in risk profiles across countries and economic cycles, with banks in emerging markets generally facing higher risk.

Macroeconomic conditions also influence outcomes: GDP growth supports BLC, while inflation and unemployment reduce it, reinforcing the procyclical behavior of banks. Robustness checks confirm that the interaction between MP and bank risk is stable and statistically significant. These findings highlight the need for risk-sensitive and tailored policy responses, especially in downturns, to maintain effective monetary transmission and financial stability.

Moreover, the analysis underscores the importance of internal bank characteristics such as profitability, capital structure, and operating efficiency—in shaping liquidity creation responses to monetary policy. Profitable banks with strong returns on assets (ROA) and higher net income are better positioned to expand credit and liquidity in response to policy easing. In contrast, banks with higher capital buffers and greater operating costs tend to adopt more conservative strategies, potentially limiting their liquidity provision, even in favorable policy environments. These patterns suggest that beyond risk exposure, financial health and cost efficiency are crucial determinants of how banks translate MP signals into lending behavior.

The findings also carry significant **policy** implications for regulators and central banks. In particular, they highlight the limitations of uniform monetary interventions across heterogeneous banking systems. Tailored approaches such as countercyclical capital buffers, targeted liquidity facilities, or differentiated reserve requirements—may be necessary to support high-risk institutions without distorting market discipline. Integrating monetary and macroprudential frameworks can enhance financial system resilience, especially during periods of economic turbulence. In the long term, strengthening risk management, promoting bank governance reforms, and leveraging digital tools for real-time risk assessment could further improve the effectiveness of monetary policy transmission in diverse banking environments.



Bank Risk Moderates the Relationship between Monetary Policy and Bank Liquidity Creation across Business Cycle

This section explores how bank risk moderates the relationship between MP and BLC across different phases of the BC. The analysis includes interactions between MPM and bank risk during peak, recession, expansion, and recovery phases. The findings provide insights into how the effectiveness of MP varies with the level of bank risk under different economic conditions. The dependent variable in all models is BLC, with the lagged dependent variable (BLC~1) included to account for persistence in BLC. The primary independent variables include MPM, bank risk, and their interactions across different BC phases. Additionally, the models control for various bank-specific factors such as ROA, net income, average asset, average equity, average liabilities, bank capital, operating expenses, bank debt, bank size, and asset quality. Macroeconomic indicators such as real GDP (RGDP) and inflation rate are also included to capture the broader economic environment's impact on BLC. The significant positive coefficients for RGDP suggest that economic growth supports BLC, consistent with the pro cyclical nature of banking activities. Conversely, the generally negative coefficients for inflation rate indicate that higher inflation can dampen BLC, possibly due to increased uncertainty and cost pressures.

The results also show that the interaction effects between MPM and bank risk are strongest during recession and peak phases, indicating heightened sensitivity of bank behavior at economic turning points. During recessions, high-risk banks exhibit a significantly reduced ability to support liquidity creation, likely due to capital constraints and increased credit risk. In contrast, the moderation effect is weaker during recovery, suggesting that riskier banks gradually regain confidence as macroeconomic conditions improve. These dynamics highlight the asymmetric response of banks across the cycle, reinforcing the need for countercyclical regulatory interventions to stabilize liquidity provision during downturns and prevent excessive risk-taking during peaks.

Table 1: Bank risk moderates the relationship between MP and BLC across BC

	(1)	(1)	(1)	(1)
	BLC	BLC	BLC	BLC
BLC~1	1.112*** (0.212)	1.981*** (0.112)	0.981*** (0.115)	1.103*** (0.213)
Interest rate	-0.113 (0.124)			
Bank risk	0.572** (0.270)	0.612** (0.125)	0.712** (0.137)	0.592** (0.192)
MPM (r) x Bank risk	-	-1.003** (0.333)		
MPM (r)x Bank risk x Peak			-1.113*** (0.213)	-0.987*** (0.231)
MPM (r) x Bank risk x Recession			-1.331*** (0.111)	-1.565*** (0.098)



MPM (r) x Bank risk x Expansion				-1.003***
				(0.098)
MPM x Bank risk x Recovery				-1.443***
				(0.101)
ROA	0.981***	1.081***	1.014***	1.013***
	(0.275)	(0.245)	(0.277)	(0.280)
Net income	0.103***	0.102***	0.105***	0.107***
	(0.011)	(0.012)	(0.011)	(0.011)
Average asset	2.797***	2.296***	2.735***	2.751***
	(0.336)	(0.336)	(0.347)	(0.347)
Average equity	-0.542***	-0.453***	-0.545***	-0.537***
	(0.054)	(0.056)	(0.054)	(0.052)
Average liabilities	-2.055***	-1.985***	-2.118***	-2.330***
	(0.297)	(0.321)	(0.304)	(0.313)
Bank capital	-2.553***	-2.765***	-2.470***	-2.331***
	(0.393)	(0.431)	(0.404)	(0.407)
Operating expense	-1.690***	-1.291***	-1.651***	-1.554***
	(0.303)	(0.332)	(0.306)	(0.302)
Bank debt	2.372***	2.476***	2.419***	2.573***
	(0.618)	(0.567)	(0.621)	(0.628)
Bank size	2.852***	2.952***	3.125***	3.154***
	(0.129)	(0.123)	(0.321)	(0.521)
Asset quality	0.344***	0.544***	0.368	0.693*
	(0.357)	(0.544)	(0.356)	(0.376)
RGDP	0.203**	0.199**	0.045**	0.173**
	(0.031)	(0.051)	(0.021)	(0.92)
Inflation rate	-0.181**	-0.914**	-0.099**	0.087**
	(0.043)	(0.067)	(0.022)	(0.034)
Constant	0.758	0.659	0.686	0.456
	(0.314)	(0.412)	(0.434)	(0.145)
Diagnostic Tests				
No of obs.	51590	51590	51590	51590
No of groups	8001	8001	8001	8001
No of instruments	131	131	131	131
AR-1	0.002	0.004	0.005	0.002
p-value	0.001	0.001	0.002	0.001
AR-2	0.786	0.776	0.763	0.690
p-value	0.209	0.203	0.343	0.333
J-Statistic	108.21	109.21	105.21	108.43
p-value	0.443	0.411	0.643	0.545



Note: The table reports coefficients from dynamic panel GMM estimations, with standard errors in parentheses and significance levels indicated by *** $p < 0.01$, ** $p < 0.05$, and $p < 0.10$.

The analysis reveals that bank risk acts as a moderator in the relationship between MP and BLC across the BC. The coefficient for the interaction term between MPM and bank risk indicates a significant effect, suggesting that the impact of MP on BLC varies depending on the level of bank risk. This finding aligns with recent literature emphasizing the role of bank risk in influencing the effectiveness of MP transmission mechanisms (Acharya & Steffen, 2020).

Specifically, during periods of economic expansion, the interaction effect between MPM and bank risk is negative, suggesting that higher levels of bank risk are associated with a restrained response to MPM in terms of BLC. This behaviour is in line with the risk aversion hypothesis, which posits that banks with higher risk profiles may adopt more cautious strategies to safeguard their financial stability. Riskier banks might prioritize mitigating potential losses rather than capitalizing on economic upturns, leading them to limit credit extension and liquidity provision (Jimenez et al., 2014). From a theoretical perspective, the buffer-stock theory of liquidity explains this cautious behavior, as riskier banks may focus on accumulating liquidity buffers during favorable economic conditions to prepare for potential bust. Instead of aggressively expanding their lending activities in response to accommodative MP, these banks may aim to strengthen their balance sheets, reducing their vulnerability to future shocks.

Additionally, the credit rationing theory (Stiglitz and Weiss, 1981) provides further insights. Riskier banks, facing a higher likelihood of defaults, may deliberately limit their credit supply to avoid exacerbating their exposure to bad loans, even during economic expansions. This conservative approach tempers their response to MP and reflects a strategic decision to manage elevated risks. Research by Kashyap et al. (2021) supported this view, noting that banks with higher risk exposure often adopt conservative strategies during boom, focusing on stabilizing their operations rather than exploiting favorable market conditions. This behavior underscores the complex connection between risk management and MP, highlighting how bank-specific factors can influence broader economic dynamics. It also suggests that tailoring MP responses to account for varying risk levels among banks could enhance the effectiveness of such measures in stabilizing the financial system.

During economic bust, the interaction effect between MPM and bank risk becomes more pronounced, with higher levels of bank risk exacerbating the contraction in BLC in response to restrictive MPM. This behavior aligns with the "risk-taking channel hypothesis", which posits that riskier banks are more sensitive to MP changes and tend to withdraw from lending and liquidity provision more aggressively during financial stress (Kashyap & Stein, 2021). These banks, already operating with elevated risk exposure, are likely to respond conservatively to mitigate potential losses, leading to a sharper contraction in credit supply.

The pro cyclicality of bank behavior, as explained by the financial accelerator theory (Bernanke, Gertler, and Gilchrist, 1996), further supports this dynamic. During bust, deteriorating borrower creditworthiness and declining asset values heighten credit risks. Riskier banks, facing increased default rates and funding pressures, may prioritize liquidity hoarding over lending to preserve capital, thereby amplifying the adverse effects of monetary tightening on overall liquidity provision.



Additionally, the precautionary motive theory highlights that banks with higher levels of risk are likely to adopt defensive financial strategies during economic stress, focusing on conserving liquidity to navigate potential shocks. Adrian et al. (2020) elaborated that during bust, riskier banks are particularly vulnerable to funding pressures and increased defaults, which constrain their ability to extend credit and lead to more drastic reductions in lending compared to their less risky counterparts. This behavior not only exacerbates the contraction in liquidity but also amplifies financial instability during bust, as riskier banks' withdrawal from liquidity provision further tightens credit conditions in the broader economy. These findings underscore the need for targeted regulatory measures to support riskier banks during periods of economic stress, such as capital injections or liquidity facilities, to mitigate their outsized impact on financial stability.

Moreover, the analysis underscores the significant influence of other bank specific factors such as ROA, net income, and bank capital on BLC, highlighting the complex connection between macroeconomic conditions and micro-level bank dynamics in shaping liquidity provision behavior. For instance, a ROA and net income are positively associated with BLC, indicating that more profitable banks are better equipped to extend credit and provide liquidity. These banks have stronger financial health, allowing them to take on more lending opportunities and support liquidity needs in the economy (Kunt et al., 2021).

In summary, the results suggest that bank risk plays a crucial role in moderating the relationship between MP and BLC across the BC, with implications for financial stability and the effectiveness of MP transmission mechanisms. Policymakers should take into account the risk profiles of banks when formulating MP, especially during economic bust, to mitigate potential adverse effects on liquidity provision and financial stability. By understanding how different levels of bank risk affect responses to MP, regulators can tailor their interventions to ensure that liquidity remains adequately supported across the banking sector (Galati & Moessner, 2018).

The findings highlight the importance of considering bank specific characteristics, particularly risk levels, in the design and implementation of MP. The differential impact of MP on banks with varying risk profiles underscores the need for a detailed approach that addresses the specific vulnerabilities and strengths of different banks. By doing so, policymakers can enhance the stability and resilience of the financial system, ensuring that MP remains effective in promoting economic growth and financial stability across all phases of the BC (Acharya & Steffen, 2020; Demirgüç-Kunt et al., 2021). Integrating macroprudential policies with traditional monetary measures can provide a comprehensive framework for maintaining financial stability and supporting sustainable economic development (Galati & Moessner, 2018; Schoenmaker, 2014).

Bank Risk Moderates the Relationship between Monetary Policy and Bank Liquidity Creation across the Financial Cycle

This section investigates how bank risk moderates the relationship between MP and BLC across different phases of the FC. The analysis examines interactions between MPM and bank risk during boom and bust periods. The results offer insights into how the effectiveness of MP is influenced by the level of bank risk under varying economic conditions.

The FC, characterized by periods of economic boom and bust, has a profound impact on banking operations and BLC. During boom periods, characterized by economic expansion and optimism, banks typically engage in more aggressive BLC, leveraging favorable economic conditions.



Conversely, during bust periods, characterized by economic contraction and increased uncertainty, banks tend to be more cautious, reducing BLC to mitigate risks.

The analysis focuses on the interconnection between MPM and bank risk during these distinct FC phases. It considers how higher levels of bank risk can amplify or mitigate the effects of MP on BLC. Specifically, the study includes interaction terms between MPM and bank risk during boom and bust periods to capture the differential impacts.

Table 2: Bank risk moderates the relationship between MP and BLC across FC

	(1)
	BLC
BLC~1	1.221***
	(0.112)
Bank risk	0.577**
	(0.279)**
MPM (r)x Bank risk x Boom	-0.991
	(0.222)
MPM (r)x Bank risk x Bust	-1.233**
	(0.211)
ROA	1.007***
	(0.281)
Net income	0.105***
	(0.012)
Average asset	2.645***
	(0.440)
Average equity	-0.537***
	(0.059)
Average liabilities	-2.109***
	(0.314)
Bank capital	-2.412***
	(0.461)
Operating expense	-2.634***
	(0.318)
Bank debt	2.454***
	(0.651)
Bank size	1.945***
	(0.415)
Asset quality	0.338
	(0.077)
RGDP	0.022*
	(0.010)
Inflation rate	-0.011
	(0.002)
Cons	0.688



	(0.323)
Diagnostic Tests	
No of obs.	51590
No of groups	8001
No of instruments	131
AR-1	0.003
p-value	0.001
AR-2	0.775
p-value	0.312
J-Statistic	109.16
p-value	0.566

Note: Bank risk significantly moderates the relationship between MP and BLC during different phases of the FC.

The findings suggest that bank risk acts as a crucial moderator in the relationship between MP and BLC throughout the FC. This moderation means that the impact of MPM on BLC by banks varies depending on the banks' risk levels. Specifically, the significant coefficient for the interaction term between MPM and bank risk underscores how bank risk intricately affects the transmission of MP to BLC. This match with study of Berrospide et al. (2019), which emphasized the role of bank risk in determining the efficacy of MP, and further supported by recent studies such as those by Shin et al. (2020) and Heider et al.(2021), which pointed out the dynamic relationship between bank risk and MP effects.

During periods of economic expansion, the interaction effect between MPM and bank risk is negative but not statistically significant. This indicates that during upturns, the influence of bank risk on the relationship between MP and BLC diminishes. In such periods, banks generally exhibit higher confidence and are more inclined to extend credit, driven by the optimistic economic environment. This widespread confidence and the abundance of lending opportunities can overshadow the typically cautious behavior associated with higher risk, thereby making the moderating effect of bank risk on MP less pronounced.

This behavior aligns with the pro cyclical risk taking hypothesis, which suggests that during economic boom, banks' risk need increase as they perceive a lower likelihood of adverse outcomes. Buch et al. (2019) provided evidence that banks adopt more aggressive risk taking strategies during expansions, capitalizing on favorable economic conditions. Additionally, the credit boom theory explains that the availability of profitable opportunities during expansions incentivizes banks to relax lending standards and focus on maximizing short term gains. Acharya et al. (2020) argued that during such periods, the perception of risk diminishes as banks prioritize exploiting the abundance of economic opportunities over managing potential vulnerabilities.

Furthermore, Minsky's Financial Instability Hypothesis suggests that during economic boom, the financial system transitions toward speculative and even Ponzi financing, reflecting reduced attention to risks as market optimism prevails. This behavioral shift reduces the impact of risk on BLC, as banks emphasize expanding their market share and capitalizing on favorable conditions. The findings highlight that during economic boom, bank risk plays a subdued role in shaping the relationship between MP and BLC, as optimism and aggressive risk-taking dominate the financial



landscape. This underscores the importance of macroprudential measures during expansions to prevent excessive risk taking that could destabilize the financial system in the longer term.

In contrast, during economic bust or bust periods, the interaction effect becomes significantly negative. This indicates that higher levels of bank risk are associated with a weaker response to MPM in terms of BLC. Riskier banks, facing elevated uncertainty and potential financial stress, tend to adopt more conservative strategies during these periods, scaling back lending and liquidity provision to mitigate potential losses. This behavior aligns with the risk aversion hypothesis, which posits that banks with higher perceived risk prioritize capital preservation over credit expansion, particularly in adverse economic conditions. Jimenez et al. (2014) provided evidence of this cautious approach, demonstrating that banks with higher risk exposure are more likely to reduce lending during bust to avoid amplifying their vulnerabilities. The credit rationing theory (Stiglitz and Weiss, 1981) also supports this finding, explaining that in periods of financial stress, banks especially those with higher risk, tighten credit supply to minimize exposure to potentially defaulting borrowers. This results in a more muted response to MPM aimed at stimulating BLC. Additionally, Adrian et al. (2020) highlighted that riskier banks face greater funding pressures and are more likely to hoard liquidity during bust to buffer against potential losses. This behavior reflects the precautionary motive theory, where financial institutions, perceiving heightened risk, conserve resources to prepare for further economic uncertainty. Allen et al. (2020) further discussed how risk-averse banks reduce lending to preserve capital, noting that this behavior exacerbates the cyclical tightening of credit conditions during economic bust. This not only dampens the impact of MP but also highlights the pro cyclical nature of risk management in the banking sector.

The analysis also highlights the significant influence of various bank specific factors on BLC. For instance, a ROA is associated with increased BLC, implying that more profitable banks are better positioned to extend credit and provide liquidity. Similarly, higher net income contributes positively to BLC, reinforcing the importance of profitability in a bank's ability to generate liquidity. Conversely, higher bank capital is associated with reduced BLC, which may reflect a more conservative stance taken by well capitalized banks to maintain their capital buffers. This finding line up with the "buffer theory of capital" proposed by Berger et al. (2013), suggested that well-capitalized banks prioritize stability over growth. Additionally, higher operating expenses are negatively related to BLC, indicating that more efficient banks with lower operating costs are better at creating liquidity. Both bank debt and bank size positively influence BLC, suggesting that larger banks and those with higher debt levels can create more liquidity due to better access to funding markets. These relationships are corroborated by recent empirical evidence presented by Kok et al. (2021).

Furthermore, macroeconomic conditions also play a role in influencing liquidity creation. Real GDP (RGDP) has a positive but marginally significant effect, indicating that overall economic growth supports BLC. However, the inflation rate does not show a significant effect in this model. Recent studies, such as those by Borio, Disyatat et al. (2020), have emphasized the importance of considering macroeconomic variables when assessing the impact of MP on bank behavior. These findings suggest that economic growth can enhance BLC by improving credit demand and asset quality, inflation may introduce complexities that offset these benefits.



Overall, the results indicate that bank risk moderates the relationship between MP and BLC across the FC. This has important implications for financial stability and the effectiveness of MP transmission mechanisms. Policymakers should consider the risk profiles of banks when designing and implementing MPM, particularly during economic bust, to ensure these measures effectively stimulate BLC and support economic recovery. Recent discussions by Carstens et al.(2021) and Cecchetti et al. (2022) underscored the critical need for tailored policy interventions that account for the heterogeneous risk profiles of banks to enhance the overall stability and efficacy of the financial system. Additionally, regulatory bodies should focus on strengthening bank resilience through robust capital adequacy requirements and effective risk management practices, as suggested by the Basel III framework (BIS, 2020).

The findings highlight the importance of considering bank specific characteristics, particularly risk levels, in the design and implementation of MP. The differential impact of MP on banks with varying risk profiles underscores the need for a complex approach that addresses the specific vulnerabilities and strengths of different banks. By doing so, policymakers can enhance the stability and resilience of the financial system, ensuring that MP remains effective in promoting economic growth and financial stability across all phases of the BC (Acharya & Steffen, 2020; Kunt et al., 2021). Integrating macroprudential policies with traditional monetary measures can provide a comprehensive framework for maintaining financial stability and supporting sustainable economic development (Galati & Moessner, 2018; Schoenmaker, 2014). This approach is crucial for maintaining a stable financial system that supports sustainable economic development, as highlighted by the IMF's recent studies on the connection between macro prudential and monetary policies (IMF, 2021).

6. Conclusion

Findings suggest that MP effectiveness is not uniform; rather, it is contingent on bank-level risk profiles. Policymakers should consider differentiated macroprudential measures, including risk-weighted capital requirements, targeted liquidity provisions, and enhanced stress testing for high-risk institutions. Integrating MP with macroprudential frameworks can strengthen systemic resilience, mitigating the adverse effects of tightening policies on vulnerable banks. Future research could explore the role of digital financial innovations and climate-related risks in moderating MP transmission. Furthermore, the conclusion underscores the need for continuous monitoring of global financial developments and the evolution of banking structures in response to shifting regulatory and technological environments. It also highlights the necessity of embedding resilience frameworks that account for interconnected economic systems and the potential emergence of new financial risks such as cybersecurity and sustainability-related challenges. Moreover, the study calls for enhanced data-driven approaches, including machine learning and big data analytics, to improve risk assessment and decision-making processes in both policy formulation and bank management. The evidence from this study provides crucial insights for central banks and regulatory authorities seeking to navigate the increasingly complex landscape of monetary transmission mechanisms. By demonstrating the asymmetric effects of monetary policy across banks with different risk profiles and across phases of both business and financial cycles, the findings challenge the efficacy of uniform policy responses. This necessitates a shift from “one-size-fits-all” approaches toward more flexible and responsive frameworks that can accommodate the diversity of risk exposures within the banking system. This could include the



development of countercyclical policy instruments that automatically adjust based on prevailing risk metrics or stress indicators, thereby enhancing the timeliness and accuracy of interventions. Moreover, incorporating bank-level risk assessments into macroeconomic forecasting models may help in predicting and mitigating unintended spillover effects of policy shifts.

In addition, the integration of advanced data analytics tools into supervisory and regulatory processes can significantly enhance the ability of policymakers to identify vulnerabilities and adapt their strategies accordingly. With the increasing digitization of financial services and the rise of complex interbank networks, the use of machine learning algorithms, real-time monitoring systems, and predictive analytics could provide a forward-looking perspective on systemic risk accumulation. Furthermore, future monetary policy design must consider emerging threats such as climate change, cybersecurity, and fintech disruptions, all of which carry substantial implications for bank risk and resilience. Ultimately, ensuring effective policy transmission in a rapidly evolving financial environment requires a multidimensional approach that blends traditional macroeconomic tools with cutting-edge risk management techniques and adaptive regulatory architectures.

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