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Monetary Policy, Basel III Liquidity Regulation, and Bank Stability: Evidence from the Pakistani Banking Sector

Noman Faiz[1], Dr. Khurram Iftikhar[2] & Ghullam Qadir[3]

[1]*M.Phil Scholar Applied Economics Research Centre University of Karachi, Email: nomanfaizrcdc@gmail.com*
[2]*Assistant Professor, Applied Economics Research Centre, University of Karachi, Email: khurram.iftikhar@aerc.edu.pk*
[3]*M.Phill Scholar Applied Economics Research Centre, University of Karachi, Email: Qadir2034@gmail.com*

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Corresponding Author:
Noman Faiz
Email:
nomanfaizrcdc@gmail.com

ABSTRACT

The study investigates the relationship between monetary policy and bank stability in Pakistan and how the Basel III liquidity regulations moderate the relationship. The analysis is conducted using a panel dataset of 21 commercial banks for the period 2012-2023, and a dynamic panel estimation method of the two-step System GMM is used to deal with the endogeneity, persistence and unobserved bank-specific heterogeneity in the data. The empirical results show that monetary policy has a significant effect on bank stability. The cash reserve ratio and the interest rate on lending are negatively related to the Z-Score in most specifications and are statistically significant, indicating that tighter monetary conditions could have a negative impact on bank stability by reducing liquidity and raising the cost of borrowing. Operational efficiency, capitalization and profitability are also important bank-specific factors that impact financial resilience. The results also show that Basel III's liquidity requirements, especially LCR, have a positive impact on the bank stability. The interaction results suggest that the impact of monetary policy is cushioned by regulatory liquidity buffers, suggesting that more robust liquidity positions allow banks to absorb shocks of monetary policy. Overall, the results highlight the importance of coordination between monetary policy and macro prudential regulation in maintaining financial stability in Pakistan's banking sector.

Introduction

Since the onset of the global financial crisis (GFC) in 2008, financial stability has emerged as one of the top priorities of modern central banking. Prior to the crisis, monetary policy had primarily

been used to fight inflation and promote economic growth. But the crisis showed that financial stability is not necessarily synonymous with price stability. During times of low inflation, financial imbalances can quietly build up in the banking system. Consequently a number of researchers and policy makers started to investigate the impact of monetary policy actions on financial institutions' stability, especially commercial banks, which are the main financial intermediaries in many developing countries.

The banking system in Pakistan is the most dominant sector of the financial system. Commercial banks are the biggest component of financial assets and are the main source of credit for the household, corporate, and government sectors. The transmission mechanism of monetary policy in Pakistan is mainly through the behavior of banks, due to the limited size and underdeveloped nature of the capital market. Policy rates and reserve requirements have an immediate impact on the banks' funding costs, their capacity to lend and their portfolio decisions. Hence, the importance of understanding the impact of monetary policy on bank stability is crucial to achieve macroeconomic balance and financial resilience.

The risk taking channel of monetary policy has been stressed in the recent literature. This idea implies that, in addition to the amount of credit a bank is able to extend, the amount of risk a bank is willing to take is also affected by monetary conditions. Borio and Zhu (2012) suggest that low interest rates over time can cause risk premiums to be reduced, and induce banks to look for yield by increasing credit to riskier borrowers. Likewise, Dell'Ariccia et al. (2017) demonstrate that an accommodative monetary policy can raise leverage and lower the standards of lending. However, tighter monetary policy can have a beneficial effect on credit discipline and limit excessive risk taking (Maddaloni&Peydró, 2011). Many of these studies are focused on the advanced economies, but the implications are equally relevant to emerging markets with less developed financial systems, where financial systems may be more sensitive to macroeconomic shocks.

The Z Score is becoming more popular as an indicator of bank stability to assess financial resilience more comprehensively. The Z Score is a measure of a bank's distance from insolvency, derived by combining profitability, leverage and earnings volatility into a single indicator. It indicates the number of standard deviations a bank's return on assets must fall to wipe out its equity. The higher the Z Score the more stable and less likely to default. The measure has been adopted by many banks studies (Laeven& Levine, 2009;Čihák& Hesse, 2010) as it reflects both risk and capital buffer effects in one measure. The Z Score offers a more comprehensive perspective on financial soundness than do simple non-performing loan ratios.

In addition to the monetary changes, regulatory changes have transformed banking supervision over the last decade.In parallel with the monetary changes, the world has undergone regulatory changes, which have transformed banking supervision over the last decade. Basel III is a framework of banking regulations that was introduced to help improve the capital and liquidity positions of banks after the global crisis. In particular, the Liquidity Coverage Ratio and the Net Stable Funding Ratio were designed to reduce short term funding risks and improve long term funding stability. These measures are to reduce over-maturity transformation and increase the resilience to liquidity shocks. Theoretically, banks' sensitivity to monetary policy changes could be dampened by the liquidity buffers, which would help to limit the risk taking channel (Gambacorta& Shin, 2018). However, empirical evidence from the banking systems of Europe and Asia suggests that better capitalized and liquid banks are more responsive to monetary shocks than less robust banks (Giordana& Schumacher, 2017; Jiang & Yuan, 2022).

The implementation of Basel III standards in Pakistan started in 2013 and was phased in over the years, with significant liquidity requirements being implemented in subsequent years. The country

also had noteworthy monetary cycles in the period, including high inflation rates, large interest rate changes, and external balance pressures. These circumstances provide a relevant scenario to investigate the effect of monetary policy on bank stability and the moderating effect of Basel III liquidity requirements.

Although there is considerable literature on monetary policy and financial stability at international level, the evidence for Pakistan is limited. Most existing studies are based on bank profitability, credit growth or non-performing loans, and fewer on bank stability measures such as insolvency based measures. Furthermore, the relationship between monetary policy and Basel III liquidity requirement has not been fully examined in the Pakistani context. This is significant because structural constraints, fiscal pressures and increased macroeconomic volatility can lead to greater transmission effects in emerging economies.

This study aims to address this issue by analyzing the effect of monetary policy on bank stability in Pakistan during 2012-2023 using Z Score as a key indicator of bank stability. It also examines the impact of Basel III liquidity requirements on the link between monetary policy and bank stability. A dynamic panel estimation approach is used to take into consideration the persistence of bank stability and possible endogeneity between policy variables and bank performance. The results are likely to be relevant for the literature on monetary transmission and macroprudential regulation in emerging economies and to offer policy suggestions for better coordination of monetary and regulatory policies.

It is important to review the literature in order to gain insight into the impact of monetary policy on bank stability and how the regulatory environment could affect this impact. The next section reviews the previous studies on the risk taking channel of monetary policy, the effects of bank-specific characteristics, and the impact of Basel III on financial stability.

Literature Review

The main theoretical and empirical studies related to monetary policy, bank stability and the moderating effect of Basel III liquidity regulation are reviewed. This thesis is divided into three parts, for which the review first clarifies the risk taking channel of monetary policy, then presents the concept of bank stability in terms of the Z Score and concludes with an explanation of why Basel III liquidity standards could lead to a less direct relationship between monetary policy and bank stability.

Monetary Policy and Bank Risk Taking

The traditional monetary policy frameworks provide an understanding of how monetary policy rate changes affect borrowing costs, investment and aggregate demand. Early research focused primarily on the interest rate channel and the credit channel, which involve the effects of monetary tightening on the cost of funds and on the volume of loans, respectively, and monetary easing on the opposite effects (Bernanke &Gertler, 1995). As the researchers continued to observe the effects of monetary policy over time, they noticed that the amount of money the banks lent out was not the only thing that was affected by monetary policy, but the riskiness of the money they lent out as well, particularly during long periods of low interest rates.

The risk taking channel of monetary policy is the idea. The risk taking channel refers to the possibility that banks might take more risks in lending to borrowers with lower credit quality, tightening credit standards, or investing in assets with higher yields when monetary policy is made more accommodative, to ensure profits. Lower interest rates can reduce risk premia and stimulate a yield hunt, and high liquidity can undermine bank discipline and result in higher leverage, as Borio

and Zhu (2012) describe. Gambacorta (2009) further claims that the monetary policy stance can influence the risk appetite of banks through its impact on expected returns, asset prices and funding costs.

This channel has been well supported by empirical evidence, especially in industrial countries. Jiménez et al. (2014) find that in Spain, lower interest rates lead banks to lend more to risky borrowers and raise default risk in the future. Another benefit of monetary easing, demonstrated by Ioannidou et al (2015), is that it can lead to lower discipline in loan pricing, potentially leading to higher risk in loan portfolios. Maddaloni and Peydró (2011) present evidence which shows that low policy rates are associated with less stringent credit standards and riskier credit extensions in the euro area and the United States. Likewise, Dell'Ariccia et al. (2017) conclude that in the United States, low interest rates for large periods of time led to higher bank leverage and greater lending to riskier borrowers.

The evidence from emerging economies is not as consistent, though. The banking sector tends to be more concentrated, macroeconomic volatility is greater and regulatory enforcement varies over time in many developing countries. The features can either reinforce or dampen the monetary conditions effect on risk taking. Jiang and Yuan (2022) show that bank risk taking behavior in China is positively related to monetary easing, while the effect is dampened by higher regulation. Zheng et al. (2023) also find that monetary easing in emerging markets can lead to greater risk-taking, but the magnitude of this effect varies with the regulatory regime and banks' balance sheet.

Bank Stability and the Z Score Measure

Measuring bank stability needs an indicator that reflects the probability of failure, and not just credit risk. The Z Score is a commonly used indicator in the financial stability literature that reflects the distance from insolvency based on profitability, capitalization and earnings volatility. It is usually built as the sum of the return on assets and the equity to assets ratio divided by the standard deviation of return on assets. The higher the Z Score, the better the bank's ability to withstand negative shocks, and the less likely the bank is to fail (Laeven& Levine, 2009; Čihák& Hesse, 2010).

The upside of the Z Score is that it offers a wider perspective on stability and encompasses three dimensions. First, higher profitability will make it more stable, because it will generate income that will cover losses. Second, more capitalization means greater stability as equity buffers insolvency. Third, volatility of profitability is lower, which means that the performance is more predictable and the risk of sudden collapse is lower. The Z Score has been extensively used in cross country studies and country specific banking studies, for these reasons. Laeven and Levine (2009) look at the effect of governance and regulation on risk-taking and stability on the basis of bank-level data and find that stability is related to market structure as well as to the institutional environment. Čihák and Hesse (2010) investigate the determinants of stability on the basis of the Z Score, and conclude that stability is determined by the institutional environment as well as by the market structure.

The Z Score is also significant because it can be used for stability analysis even in the event of rare bank failures. Bank failures are rare in many countries such as Pakistan, due to regulatory measures and restructuring policies. Thus, a continuous stability proxy, like the Z Score, can be used to investigate solvency risk without the need to rely on failure events.

Basel III Liquidity Standards and Bank Stability

Following the global financial crisis, regulators realized that weak capital was not the sole reason for bank failures, but also because of liquidity problems and volatile funding sources. Basel III was designed to increase resilience by imposing higher capital buffers, the leverage ratio and two important liquidity requirements, the Liquidity Coverage Ratio and the Net Stable Funding Ratio (Basel Committee on Banking Supervision, 2011). The Liquidity Coverage Ratio is a ratio that banks must maintain to ensure that they have enough high-quality liquid assets to weather a short term liquidity shock. The Net Stable Funding Ratio is designed to promote long term funding in line with the maturity of assets.

Under ideal conditions, liquidity regulation can influence the reaction of banks to monetary policy. If banks are forced to keep larger stockpiles of liquid assets and stable funding, it may be harder for them to increase their supply of risky loans in periods of low interest rates. Gambacorta and Shin (2018) believe that well capitalized and liquid banks are less sensitive to low interest rates due to the presence of regulatory buffers that diminish the incentives for aggressive balance sheet growth. Giordana and Schumacher (2017) also offer evidence that liquidity standards can diminish pro cyclical conduct and decrease default risk in banking systems, particularly in times of macroeconomic uncertainty.

Meanwhile, other research indicates that liquidity regulation might impose costs on banks. The more banks are forced to keep low-yielding liquid assets, the less profitable they will be, and this can affect stability by affecting earnings. The net impact of liquidity regulation on stability might thus be a function of the trade-off between stability benefits and profitability costs. Hence, empirical testing is required, especially in emerging markets with different structural conditions compared to the advanced markets.

Monetary Policy, Basel III, and Bank Stability

There is an increasing body of literature on the interaction between monetary policy and macroprudential regulation. There is growing research to suggest that financial stability will need coordination between policy instruments, since monetary policy may not be sufficient to prevent risk accumulation in booms, and regulation may not be enough to help provide macroeconomic stability in recessions. Borio and Gambacorta (2017) point out that in a low interest rate climate, monetary policy can become less effective, and prudential policy tools become more important because risk taking incentives can increase. Basel III can also help monetary policy by decreasing financial vulnerabilities, but it could have a negative impact on credit supply, as discussed by Rubio and Carrasco-Gallego (2016).

Empirical evidence indicates that macroprudential buffers may help to buffer banks against the effects of monetary policy. Research indicates that banks that are better capitalized and have better liquidity positions are less likely to push out risk aggressively during an accommodative policy period, and more likely to stay stable during a tightening policy period. The moderating effect is relevant to the interaction models in this thesis, which aim at testing the hypothesis that Basel III liquidity ratios reduce the impact of monetary policy on bank stability.

Evidence from Pakistan

Pakistan is a significant setting as the transmission of monetary policy is heavily dependent on the banking sector. Policy measures, such as changes in policy rates and reserve requirements, impact bank funding costs and lending decisions, and macroeconomic volatility can impact borrower's ability to repay loans. It has been found in the studies conducted on Pakistan that monetary policy

has an impact on banking performance in terms of profitability and credit availability. Hussain et al. (2021) conclude that monetary policy measures have an impact on the performance of banks in Pakistan, and Khan et al. (2016) discuss the interest rate pass through phenomenon in the banking sector.

But there are fewer studies that specifically examine bank stability indicators like the Z Score, and even fewer that assess the impact of Basel III liquidity regulation on the effect of monetary policy. The stability dimension is an open area for further research in the context of monetary policy, capital regulation and bank risk taking in Pakistan, as studied by Akhter (2023). This generates a strong need to explore the relationship between monetary policy and bank stability in Pakistan through Basel III 'moderation' approach.

Conceptual Framework

As shown in figure 1 monetary policy and bank stability can be linked by various theoretical transmission channels. First, the bank lending channel implies that monetary tightening will lead to a contraction of bank liquidity and limit bank credit provision, which in turn will impact banks' profitability and financial strength. Second, the risk-taking channel of monetary policy suggests that interest rate changes affect the incentives that banks have to take risks. If interest rates remain low for an extended time, banks could be tempted to increase their loan activity to riskier borrowers to boost their profits. Third, the borrower balance sheet channel highlights that an increase in interest rates raises debt servicing costs for firms and households, which can lead to poorer loan quality and reduced stability of banks.

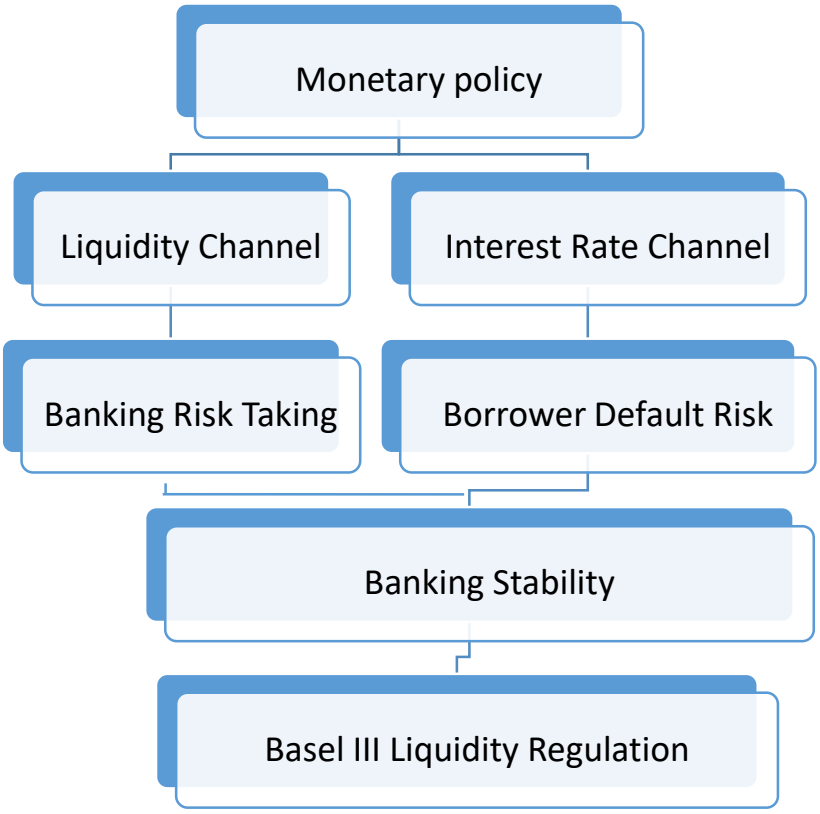

Figure 1

Summary and Research Gap

The literature provides robust evidence that the risk taking channel of monetary policy has an impact on bank risk behavior, with the magnitude of the impact varying by institutional and regulatory structures. The Z Score is a popular indicator of bank stability because it combines profitability, capitalization and volatility. Basel III liquidity requirements will enhance resilience and could lower pro cyclical risk incentives associated with monetary easing.

The existing literature offers some insights on the link between monetary policy and bank risk behaviour, but the findings are mixed and context specific. The interaction between relatively limited regulatory liquidity standards and monetary policy in determining the stability of banks in emerging economies has received relatively little attention. This gap points to the need for empirical research in the context of financial systems with banking sectors as the predominant agents of financial intermediation.

The relationship between monetary policy and Basel III liquidity regulation and their impact on bank stability in the case of Pakistan is not well explored. In the current literature, credit risk or bank performance indicators are the most common ones, and a full stability analysis based on the Z Score is scarce. In view of this, the present study investigates the impact of monetary policy on bank stability in Pakistan during the period 2012 to 2023 and also explores whether the liquidity requirements under Basel III moderate the relationship between monetary policy and bank stability.

Model and Methodology

The present study is of a quantitative and empirical nature which tries to investigate the impact of monetary policy upon the stability of banks in Pakistan with special focus on moderatory effect of Basel III liquidity requirement standard. This study uses unbalanced panel data of 21 Pakistani scheduled commercial banks for the time span 2012-2023. The chosen time frame reflects the major monetary policy cycles as well as the gradual implementation of Basel III liquidity standards by the State Bank of Pakistan, enabling a study of the interactions between the new prudential standards and monetary policy in determining bank stability over time.

Data at the bank level are derived from the annual financial statements of commercial banks and the publications of the State Bank of Pakistan such as Financial Stability Review and the regulatory disclosures. Data on monetary policy instruments, such as cash reserve ratio (CRR) and lending interest rate, is taken from official records of State Bank of Pakistan. The macroeconomic control variables are obtained from well-known sources like the World Bank or the International Monetary Fund. Data from all sources are presented at an annual frequency to provide uniformity across data sources, and extreme values are winsorized at the 1st and 99th percentiles to reduce the impact of outliers.

The Z Score represents a measure of the distance of a bank from insolvency, thus proxying bank stability. Z Score is defined as the difference between the sum of the ROA and equity to asset ratio from the standard deviation of the ROA. It combines profitability, capitalization and earnings volatility into one indicator, and has gained widespread use in the banking and financial stability literature (Laeven& Levine, 2009; Čihák& Hesse, 2010). The higher the Z Score the greater the stability and the lower the likelihood of default. The natural logarithm of the Z Score is used in the regression analysis to enhance distributional properties and to minimise skewness. To get a time varying stability measurement, the standard deviation of return on assets is calculated with a 3 year rolling window for each bank.

There are two indicators of monetary policy that reflect two different transmission mechanisms. The cash reserve ratio affects the liquidity situation of banks and their funding position, while the lending interest rate is the cost of credit and the overall attitude of monetary policy. The study can investigate the two policy channels (liquidity based and price based).

To minimize the impact of bank heterogeneity, a number of bank specific variables that are typical to empirical banking studies are introduced. Bank efficiency is expressed as a ratio of operating expenses to operating income, which indicates a manager's performance and cost discipline. Profitability is measured in terms of return on equity, which reflects how a bank is using the capital of its shareholders to earn profits. The capital adequacy ratio is used to measure capital adequacy and the capitalization ratio is used to measure capitalization. The ratio of liquid assets to total assets is used as an indicator of bank liquidity. Furthermore, real GDP growth and inflation are added because macroeconomic variables have an impact on bank stability.

Basel III regulatory standards are introduced by two pillars of liquidity: the Liquidity Coverage Ratio and the Net Stable Funding Ratio. The LCR is a tool used by a bank to assess its ability to cope with unforeseen short-term liquidity needs because it requires the bank to have enough high quality liquid assets, while the NSFR is a tool which can be used by a bank to ensure that its long term funding is sufficiently stable in the face of an asset maturity structure BCBS (2011). They are both direct factors of bank stability and factors that can moderate the effect of monetary policy on financial stability.

The study uses the two step System Generalized Method of Moments (SGMM) estimator of Arellano and Bover (1995) and Blundell and Bond (1998) to empirically examine these relationships. The methodology is suitable because the stability of the banks is not affected in the long term and some explanatory variables like the monetary policy or the bank performance indicators could be endogenous. A lagged dependent variable highlights the dynamic nature of bank stability, while the System GMM approach mitigates simultaneity bias, unobserved bank specific heterogeneity and reverse causality between policy and financial stability.

The basic empirical specification is:

$$\boldsymbol{ZScore_{it}} = \boldsymbol{\alpha ZScore_{i,t-1} + \beta_1 MP_{it} + \beta_2 Bank_{it} + \beta_3 Macro_{it} + \beta_4 Basel\ III_{it} + \beta_5 (MP_{it} \times Basel\ III_{it}) + \varepsilon_{it}}$$

where Zit represents the natural log of the Z Score for bank i at time t, MPit is an index of monetary policy indicators, Bankit is a vector of bank specific characteristics, Macroit is a vector of macroeconomic controls and BaselIIIit is a vector of indicators for Basel III liquidity standards. The interaction term is used to measure the moderating effect of Basel III on the effect of monetary policy on bank stability.

Typical diagnostic tests are used to evaluate the validity of the System GMM estimation. To ensure that there is no second order autocorrelation in the differenced residuals, the Arellano Bond tests for serial correlation are used. The Hansen and Sargan tests are used to evaluate the validity of the instrumental variables. The number of instruments is limited as per good practice in dynamic panel estimation to reduce instrument proliferation (Roodman, 2009).

Taking the whole methodological approach together, it offers a solid foundation for the assessment of the role of monetary policy and macroprudential regulation in the stability of banks in an emerging economy framework.

Table 1 Variable and Source

Variables	Symbol	Measures	References
Bank Stability	ZScore	(ROA + Equity / Assets) / Std.Dev(ROA)	Zhenget al. (2023)
Cash Reserve Ratio	CRR	CRR (%) as set by State Bank of Pakistan	(Hussain et al., 2021; Roy et al., 2023)
Lending Interest Rate (%)	LIR	Used as bank/Bank Lending Rate	(Anwar et al., 2023; Khan et al., 2016)
Net Stable Funding Ratio (%)	NSFR	ASF / RSF ≥ 100%	Basel III (BIS, 2010)
Liquidity Coverage Ratio (%)	LCR	High-Quality Liquid Assets / 30-day Net Outflows ≥ 100%	Basel III (BIS, 2010)
Capital Adequacy Ratio	CAR	(Tier 1 + Tier 2 Capital) / Risk Weighted Assets	(Ridwan&Mayapada, 2022)
Capitalization	CAP	Equity / Total Assets	Laeven& Levine (2009), Berger &Bouwman (2013)
Efficiency	EFF	Operating Expenses / Operating Income	Berger &Mester (1997), Altunbas et al. (2007)
Return on Equity	ROE	Net Income / Shareholders' Equity	Zheng et al. (2023)
Liquidity Position	LQD	Liquid Assets / Total Assets	Vázquez & Federico (2015), Bordeleau& Graham (2010)
GDP Growth	GDP1	GDP Growth (annual %)	(Akhter, 2023; Rahman et al., 2015)
Inflation	INFR	Inflation, consumer prices (annual %)	Akhter, 2023; Khan, 2022)

Source: Author's compilation based on the reference data and literature review.

The empirical analysis is then carried out by estimating the panel data by System Generalized Method of Moments, based on the specifications of the model and variables measured as discussed above. The empirical results are presented in the next section starting with the descriptive statistics and diagnostic tests, followed by the regression estimations to look at the relationship between monetary policy, Basel III regulations and bank stability.

Empirical Results

The empirical results on the linkage between monetary policy and bank stability of Pakistan has been presented and discussed in this section with special focus on the moderating effect of Basel III liquidity requirements. The results presented are drawn from dynamic panel estimations employing the two step System Generalized Method of Moments (2S-SGMM) estimator that takes into consideration endogeneity, unobserved heterogeneity, and persistence in banks' stability over time. The model specifications are tested with diagnostic tests for confirmation of the validity, such as serial correlation tests and instrument validity tests, which support the appropriateness of the System GMM framework.

In all the model specifications the lagged dependent variable is predicted to be positive and statistically significant, which shows that bank stability is highly persistent. This is consistent with the notion that bank stability will not shift abruptly over a short time horizon as balance sheet structures, profitability patterns and regulatory buffers tend to change over time. This persistence justifies the choice of a dynamic modelling framework and it is consistent with the previous banking studies based on insolvency measures of risk (e.g., Z Score). Laeven& Levine, 2009; Čihák& Hesse, 2010).

Descriptive Statistics

Description of the variables used in the analysis is summarized in Table 2 from 2012 to 2023. The statistics provide an overview of the central tendency and variation of bank stability, monetary policy measures, bank specific characteristics and macroeconomic controls.The mean Z Score is 2.816 and the standard deviation is 1.947, suggesting that there is moderate but significant variability in the stability of banks across institutions and over time. The minimum of negative 2.83 and maximum of 8.98 indicate that financial stability of most banks was found throughout the sample period, with some years showing weaker financial stability. The differences in Z Score further suggest that the stability of the banks is not fixed and support the use of a dynamic estimation framework, since financial soundness is likely to change slowly over time.

In terms of monetary policy variables, the cash reserve ratio has a moderate spread with an average of 5.25 percent, indicating a slow pace of adjustment in the cash reserve ratio. The lending interest rate, on the other hand, has a greater range from 8.21 to 17.72 percent, suggesting a significant change in the monetary attitude over the sample period. This is an ups and downs movement in response to inflationary and growth conditions in Pakistan.There is significant variation across the specific variables that are used by banks. The capital adequacy and return on equity range greatly, reflecting the variation in balance sheet strength and earnings among banks. Average liquidity levels are fairly consistent, although the liquidity varies by institution. Efficiency also exhibits dispersion, indicating variations in the cost management and operating results.

The macroeconomic indicators show moderate average growth of GDP and continued high inflation. The positive and negative growth rates suggest that the economy was volatile during the time period, and the fluctuations in the rate of inflation suggest macroeconomic volatility. In general, the data have enough variation to facilitate the estimation of panels and meaningful analysis of the relationship between monetary policy and stability.

Table 2 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ZScore	252	2.815978	1.9474	-2.82609	8.984981
CRR	252	5.25	0.433874	5	6
LIR	252	11.64695	3.127337	8.21	17.72
CAR	252	20.50339	64.39123	5.38	1036.7
CAP	252	6.833087	3.01544	-1.88701	24.31197
EFF	252	2.562712	2.158409	-11.4239	16.5762
ROE	252	14.98335	23.09652	-48.9973	336.0232
LQD	252	7.996927	2.713538	3.093579	25.40216
GDP1	252	3.792396	2.325754	-1.27409	6.573838
INFR	252	10.03986	7.634572	2.529328	30.76813

Source: Author's Estimation

Notes: Max = Maximum Value, Min = Minimum Value, S.D. = Standard Deviation, and Obs. = Observations.

Correlation Matrix

Pearson correlation coefficient values among the variables used in the study are reported in Table 3. The results show that most variables have a low-moderate correlation with each other, indicating that there are no very high correlations between variables, or multicollinearity issues. The relationship between Z Score and most of the explanatory variables is relatively low, suggesting that the stability of the banks is determined by multiple factors, and not by a single one.

As far as direction is concerned, Z Score has positive correlation with the lending interest rate, capital adequacy, profitability and inflation, which indicates that improved earning capacity and increased capital buffers are conducive to the stability of banks. The bank specific variables are most closely correlated with profitability, with higher profitability being associated with greater financial resilience with the Z Score. Efficiency and liquidity, on the other hand, have weak negative relationships with Z Score, possibly due to variations in cost structure and asset allocation among banks. The correlation between monetary policy variables and inflation is strong, with the lending interest rate exhibiting the highest positive correlation; this indicates the strong relationship between monetary tightening and inflationary pressures. The moderate relationship between the cash reserve ratio and inflation confirms the close linkage between monetary tightening and inflationary pressures. Overall, these variables are well behaved in terms of the correlation structure and they are suitable for the dynamic estimation of the panel.

Table 3. Pearson's correlation coefficients.

Variable	ZScore	CRR	LIR	CAR	CAP	EFF	ROE	LQD	GDP1	INFR
ZScore	1.0									
CRR	0.0202	1.0								
LIR	0.0769	0.5516	1.0							
CAR	0.1408	-0.0317	-0.0098	1.0						
CAP	0.0035	-0.2207	-0.0388	-0.0124	1.0					
EFF	-0.1738	0.1117	0.1178	0.027	0.0708	1.0				
ROE	0.2589	0.0479	0.0711	0.0264	-0.1965	-0.1016	1.0			
LQD	-0.0596	-0.1904	-0.0847	0.0004	0.0697	0.0193	-0.0292	1.0		
GDP1	-0.0797	0.0017	-0.4532	-0.1494	0.0277	-0.0424	-0.0324	-0.0749	1.0	
INFR	0.0796	0.7582	0.8649	0.0075	-0.1433	0.0996	0.0753	-0.1005	-0.4973	1.0

Author's Estimation

Unit Root and Diagnostic Test

To investigate the stationarity properties of the variables and to prevent misleading results in spurious regression, we first ran the panel unit root tests before estimating the dynamic panel models. The Levin–Lin–Chu panel unit root test is used as it has been widely used in panel data studies and makes the assumption of a common unit root process across the cross sections.The results of the Levin–Lin–Chu test are shown in Table 4. The results reveal that the majority of variables are stationary at level (I(0)) implying that they are integrated of order zero. Specifically, Z score, capital adequacy, capitalization, efficiency, profitability, liquidity and GDP growth fail to support the unit root null hypothesis at the conventional 10% and 5% significance levels. This means that these variables change, but do so around a stable mean over time and can be used as they are in the estimation procedure.The inflation rate and the lending interest rate, however, seem

to be integrated of order one I(1), as does the cash reserve ratio. The variables become stationary after differencing once because the levels of these variables show some persistence over time because of changes in macro-economic policy and inflation. Overall, variables with both orders of integration (I(0) and I(1)) are not a problem for the dynamic System GMM framework, as long as no I(2) variables exist. Hence, the stationarity results lend support to the appropriateness of the data set for further dynamic panel estimation.

Table 4. Levin–Lin–Chu (LLC) Panel Unit Root Test

Variables	Statistics	Probability	Results
ZScore	-9.7808***	0.0000	I(0)
CRR	-6.6514***	0.0000	I(1)
LIR	-4.0029***	0.0000	I(1)
CAR	-1.6950**	0.0450	I(0)
CAP	-5.2502***	0.0000	I(0)
EFF	-4.9641***	0.0000	I(0)
ROE	-17.9292***	0.0000	I(0)
LQD	-7.0574***	0.0000	I(0)
GDP1	-8.4060***	0.0000	I(0)
INFR	-45.5041***	0.0000	I(1)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Author's Estimation

Multicollinearity Test

Multicollinearity was checked using the Variance Inflation Factor (VIF) test for the possible multicollinearity of the explanatory variables. When there is a strong correlation among the independent variables, we call this multicollinearity; this can cause coefficients to be overestimated, and make the regression results unreliable. It is often detected in empirical studies by using the VIF test. The results of VIF for all model specifications are reported in Table 5. The mean values of VIF for all models are between 2.20 and 3.38, and the maximum values of VIF are less than 10 in all models. Multicollinearity is not considered a serious issue if VIF values are below 10, according to the conventional econometric guidelines. Based on these results, it can be concluded that the variables used in the models are quite independent from each other.The results overall do not indicate that multicollinearity is an issue for empirical analysis. The relatively low VIF values suggest that the estimated coefficients are not likely to be biased because of a high level of linear relationships among the independent variables. Thus, the variables can be added together in the System GMM estimations without compromising the validity of the estimations.

Table-11. VIF Results

Model	Mean VIF	Max VIF	Conclusion
M1.1	3.12	8.80	No multicollinearity
M1.2	2.20	5.20	No multicollinearity
M2.1	3.13	8.77	No multicollinearity
M2.2	2.21	5.17	No multicollinearity
M3.1	2.97	9.53	No multicollinearity
M3.2	2.39	6.81	No multicollinearity

M4.1	3.00	9.69	No multicollinearity
M4.2	2.44	7.05	No multicollinearity
M5.1	3.31	8.82	No multicollinearity
M5.2	2.44	7.38	No multicollinearity
M6.1	3.38	8.91	No multicollinearity
M6.2	2.43	7.22	No multicollinearity

Author's Estimation

Serial Correlation and Instrument Validity Tests

The Arellano–Bond test for serial correlation was run to check the validity of the dynamic panel estimation. The test investigates the presence of first order and/or second order autocorrelation in the differenced residuals of the System GMM estimation. The first order serial correlation is expected in dynamic panel models and the second order serial correlation is necessary for model validity in dynamic panel models. The results of all model specifications are presented in Table 6 in the form of Arellano–Bond tests. The results indicate that the AR(1) statistics are statistically significant in most of the models, which means that there is first order serial correlation in the differenced residuals. This is the expected result and in line with the properties of dynamic panel estimators.

More important, the AR(2) result is not statistically significant in most of the specifications, indicating that there is no second order serial correlation. The absence of a second order autocorrelation test indicates that the lagged variables employed as instruments are appropriate and the moment conditions of the System GMM estimator have been met. Overall, these results suggest that the dynamic panel specifications are well-specified and that the estimation results are reliable.

Table 6. Arellano-Bond Tests Results

	Order(1)		**Order(2)**	
Variables	**Z**	**Prob> Z**	**Z**	**Prob> Z**
M1.1	-2.782	0.054	-0.703	0.482
M1.2	-2.66	0.008	-0.840	0.401
M2.1	-2.93	0.003	-1.269	0.205
M2.2	-2.66	0.008	-1.420	0.156
M3.1	-3.21	0.001	-0.943	0.346
M3.2	-2.15	0.032	-1.385	0.166
M4.1	-1.51	0.130	-1.662	0.097
M4.2	-0.88	0.381	-1.926	0.054
M5.1	-2.80	0.005	-0.857	0.391
M5.2	-2.27	0.023	-1.146	0.252
M6.1	-1.66	0.098	-2.045	0.041
M6.2	-2.10	0.035	-1.550	0.121

Source: Author's Estimation

Besides the serial correlation test, the validity of the instrumental variables employed in the System GMM estimation is checked through the Sargan test of the overidentifying restrictions. This test is used to see if the instruments are exogenous and whether they are properly specified in the model. If the null hypothesis is not rejected, then the instruments are valid and error term and instruments are not correlated. The results of the Sargan test on all model specifications are

reported in Table 7. The values of the probability in each model are set as 1.00; it is concluded that the null hypothesis of instrument validity is not rejected. These indicate that the choice of instruments for the dynamic panel estimations is suitable and doesn't create endogeneityissues.Overall, the results of the Sargan test indicate the validity of the instruments used in the System GMM. These results are in agreement with each other and with the results of the Arellano–Bond serial correlation tests, which suggest that the empirical models are reliable and that the coefficients values estimated can be interpreted with reasonable confidence.

Table 7. Sargan Tests Result

Variables	chi2	Prob> chi2
M1.1	16.40585	1.00
M1.2	16.11963	1.00
M2.1	15.64137	1.00
M2.2	14.99711	1.00
M3.1	14.26878	1.00
M3.2	11.13942	1.00
M4.1	13.49762	1.00
M4.2	10.56812	1.00
M5.1	12.2757	1.00
M5.2	11.51287	1.00
M6.1	6.045113	1.00
M6.2	8.591885	1.00

Source: Author's Estimation

System GMM Estimation Results

In this section, we report the dynamic panel estimation results with the two step System Generalized Method of Moments estimator. The System GMM approach is used to overcome the potential endogeneity, unobserved bank specific heterogeneity and the persistence of bank stability over time. This method is based on the combination of equations in levels and first differences, and it offers consistent estimates in case of a lagged dependent variable. The baseline model and later the extended specification are discussed in the following subsections.

Base Model with Efficiency (Model 1 and Model 2)

The baseline results in Table 8.1 estimate bank stability (specified by the Z Score) as a function of monetary policy variables and bank specific controls. For the monetary policy indicator in Model 1.1, the cash reserve ratio is used, and for Model 1.2, the lending interest rate. Bank efficiency and other control variables are included in both models.

In both specifications, the coefficient of the lagged Z Score is positive and statistically significant. The result shows that the bank stability is high, which means that the financial status of banks tends to change over time. Banks that were more stable during the earlier period are more likely to be stable during the subsequent period. This persistence is typical of banking research and is driven by long-term relationships in lending (and balance sheet inflexibilities) (Berger & DeYoung, 1997). The monetary policy variables have showed a considerable impact on the bank stability. The cash reserve ratio is negatively and statistically significantly related to growth as indicated by the coefficient.The coefficient in Model 1.1 is negative and significant. This means that greater reserve requirements leads to lower Z Score and hence a weaker bank stability. Restrictive reserve requirements, on an economic level, cause banks to have less loanable funds

available, and can squeeze bank profits. In times of reduced profitability, banks might have shorter earnings buffers; that is, banks might be closer to insolvency. This is in line with the research that indicated that bank-dominated financial systems may be subject to bank balance sheet pressures due to restrictive liquidity requirements (Altunbas et al., 2010; Borio& Zhu, 2012).

Like this, the lending interest rate in Model 1.2 is also negatively correlated with the Z Score and statistically significant. This means that the higher the lending rates, the less stable the banks are. An increase in borrowing rates may have a negative impact on the ability to repay, default on loans, and the quality of bank assets. This makes financial distress more likely and the stability of banks less robust. Monetary tightening has also been found to have a detrimental effect on the credit quality of the borrowers' balance-sheets in previous studies (Maddaloni&Peydró, 2011; Ioannidou et al., 2015). Efficiency shows a contrasting effect in the two models among the bank specific variables. For Model 1.1, the sign and significance of the coefficient of efficiency indicate that there is a positive relationship between the efficiency of banks and the stability of banks. Efficient banks can better manage their operating expenses and have higher profitability, which enhances their financial stability. This is consistent with the efficiency risk hypothesis that emphasizes that institutions that are more cost efficient tend to have better risk management and asset quality (Berger & DeYoung, 1997; Fiordelisi et al., 2011). In Model 1.2, however, efficiency has a negative effect—a tighter interest rate condition may cause a destabilizing effect if operating costs are increased.

Capitalization is additionally positively correlated with bank stability in both models, suggesting that banks with higher capital ratios stay further away from insolvency. This is in line with the theory that higher capital buffers enhance financial resilience and the probability of bank failure is lowered (Laeven& Levine, 2009; Berger &Bouwman, 2013). But Liquidity has a negative correlation to the Z Score. This can be an opportunity cost of a high amount of liquidity, which may decrease bank profitability and thus bank stability. The overall economy also has an impact on bank stability. In Model 1.1, GDP growth has a positive effect, indicating that economic expansion has the potential to enhance the capacity of borrowers to repay and increases the bank's stability. However, the influence of inflation on bank stability is mixed in the two models, suggesting a dependent relationship between the two that could be influenced by the current monetary conditions and interest rate changes.

The baseline results suggest that monetary policy has a significant effect on the stability of banks in Pakistan, overall. Reserve requirement and interest rate charged on lending to businesses both have a significant impact on the Z Score, and this makes monetary policy transmission in a financial system where banks are the dominant players an important factor. The results of these specifications form the basis of the analyses of the interaction between Basel III regulatory standards and monetary policy in the following model specifications.

Table 8.1 Base Model ZScore = Operational Risk

Variables	**Model 1.1**	**Model 1.2**
ZScore	0.507 (0.107)***	0.493 (0.076)***
CRR	-0.517 (0.184)***	-
LIR	-	-0.022 (0.011)**
CAR	-0.02 (0.007)***	0.001 (0.002)***
LQD	-0.099 (0.030)***	-0.071 (0.024)***
EFF	0.736 (0.026)***	-0.069 (0.029)***
CAP	0.102 (0.034)	0.144 (0.072)**
GDP1	0.054 (0.015)***	-0.070 (0.016)***

INFR	-0.048 (0.013)***	0.033 (0.013)***
CONST	3.705 (1.099)***	0.946 (0.530)*

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Source: Author's Estimation

Base Models with Profitability

As an alternative to efficiency, profitability, measured in terms of return on equity, is shown in Table 8.2. The monetary policy indicator in Model 2.1 is the cash reserve ratio like in the previous specification, and in Model 2.2 the lending interest rate. These models can be used to analyze the interaction between bank profitability and monetary policy and how it affects bank stability. Both models show that the lagged Z Score continues to be positive and significant, supporting the stability of banks over time. This means that banks that had a high financial condition during the previous period, tend to have a high financial condition during the current period. This persistence is indicative of structural features of banking operations such as long-term lending relationships and the gradual changes in the structure of balances on the bank's books.

The monetary policy variables still have a negative relationship with bank stability. In Model 2.1, the cash reserve ratio is negatively co-efficiented and highly significant which suggests that lowering the cash reserve ratio will have a negative impact on the Z Score. This indicates that increased bank reserve requirements can put strain on bank profitability, and decrease the earning potential required to ensure financial stability. The interest rate of the lender is also negatively and significantly related to the Z Score in Model 2.2. Rising interest rates raise the costs to borrowers, and can make borrowers less likely to be able to repay loans, thereby reducing bank stability and asset quality. The results are consistent with the idea that restrictive monetary conditions can have an impact on bank stability, both via their influence on the bank's balance sheets and their influence on borrowers' balance sheets (Borio& Zhu, 2012; Maddaloni&Peydró, 2011). The Z Score is negatively and statistically significantly correlated with profitability (return on equity) for both specifications. Based on this discovery, it can be inferred that there is a relationship between profitability and risk taking activities undertaken by banks, but the higher profitability, the greater the risk taking activities performed, the closer the bank's distance from insolvency. This is in line with the well-documented risk return trade-off of banks, whereby a higher profitability can be linked to higher risky asset exposures (Laeven& Levine, 2009; Zheng et al., 2023).

Of the other control variables, capitalization remains positively and significantly related to bank stability. This suggests a greater resilience of banks with higher capital buffers in the event of financial distress. Liquidity, however, exhibits a negative relationship with stability again, indicating that holding large liquid balances can decrease profitability and income generating opportunities. The results of capital adequacy across the two models show mixed effects, suggesting that the regulatory capital requirement can have a different impact on stability, depending on the monetary policy environment. The stability of banks is also influenced by macroeconomic factors. In both models, there is a negative effect on GDP growth which might suggest that during times of economic growth, banks may be more willing to expand lending, with the risk of increasing exposure. There are mixed effects on the inflation as it is not clear whether the impact on the bank's stability will differ based on the reaction of monetary policy to inflationary pressure.

Overall, the findings of the profitability based models support the findings of the other models that monetary policy has significant influence on bank stability in Pakistan. The Z score affects the profitability and capitalization of banks, and is affected by reserve requirements and lending

interest rates. The results again lend additional credence to the possibility of a monetary policy channel, which operates both through liquidity and balance sheet considerations, that impacts on the stability of banks.

Table 8.2. Base Model ZScore = Market Risk

Variables	Model 2.1	Model 2.2
ZScore	0.495 (0.088)***	0.439 (0.071)***
CRR	-0.628 (0.204)***	-
LIR	-	-0.039 (0.018)**
CAR	-0.0013 (0.005)**	0.008 (0.001)***
LQD	-0.093 (0.029)***	-0.076 (0.024)**
ROE	-0.017 (0.004)***	-0.017 (0.004)***
CAP	0.156 (0.469)***	0.184 (0.049)***
GDP1	-0.047 (0.007)***	-0.058 (0.012)***
INFR	-0.055 (0.014)***	0.044 (0.015)**
CONST	-3.72 (0.964)***	0.787 (0.498)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Source: Author's Estimation

Extended Models with Basel III (Model 5 and Model 6)

Table 8.3 gives the extended baseline model with the inclusion of Basel III liquidity requirements. In particular, the Liquidity Coverage Ratio and Net Stable Funding Ratio are discussed to explore how regulatory liquidity requirements affect bank stability and affect monetary policy. The cash reserve ratio is the monetary policy indicator in Model 3.1, and lending interest rate in Model 3.2. In both specifications the coefficient of the lagged Z Score stays positive, however, not statistically distinct in Model 3.2. The persistence seen in older models is reduced with the addition of Basel III liquidity requirements. This shift implies that the liquidity requirements of regulation may help to bring about balance sheet discipline that makes the current stability less reliant on the past stability of the banking system. The purpose of Basel III was to increase banks' resilience by improving liquidity management, to prevent excessive accumulation of risk over time (BCBS, 2011; Gambacorta& Shin, 2018).

The bank's stability remains being affected by the monetary policy variables as well. Model 3.1 indicates that the cash reserve ratio is statistically significant and negatively related to the Z Score. This suggests that tightened reserve requirements have a negative effect on bank stability as earlier baseline results indicate. Closer ratios decrease liquidity and banks' ability to earn income from lending, potentially compromising profitability and creating a closer margin between profitability and insolvency. The interest rate on the loan is also negatively and significantly related to the Z Score in Model 3.2. Rising interest rates can raise the cost of borrowing and may raise the risk of borrowers defaulting, thus reducing the quality of the bank's assets and ultimately the stability of banks (Maddaloni&Peydró, 2011; Ioannidou et al., 2015).

An interesting point in this specification is that certain bank specific variables that had proved important before addition of Basel III indicators are no longer statistically important. For instance, the liquidity ratio is irrelevant in both models. This shift can be justified with the Basel III liquidity measures, which illustrate more directly than traditional liquidity measures the liquidity risk. Shorter term and longer term liquidity resilience are better measured by the Liquidity Coverage Ratio and the Net Stable Funding Ratio, respectively. Consequently, the meaning of the simple

liquidity ratio is reduced with the addition of these regulatory ratios. These results are consistent with those that have been reported in works on the implementation of Basel III: regulatory liquidity indicators are used instead of the traditional balance sheet indicators to explain bank stability (Giordana& Schumacher, 2017).

There is a similar pattern for capitalization; it also is not statistically significant within these longer models. The Basel III regulations already have tougher capital and liquidity standards, which indirectly boost banks' solvency position, perhaps that's why. Thereafter, the marginal effect of capitalisation on stability diminishes when taken into account the regulatory mechanisms. That is, Basel III norms can take a share of the stabilizing effect that has been previously assigned to bank level capital buffers (Gambacorta& Shin, 2018). The Basel III liquidity indicators give valuable insights. The LCR in both models has positive and statistically significant correlation with the Z Score. This finding suggests that the greater the short-term liquidity buffer, the more stable the banks will be because they will have more high-quality liquid assets to buffer against funding shocks. These buffers help minimise the risk of liquidity induced distress and enhance financial resilience overall. This discovery is consistent with the key goal of Basel III liquidity reforms to improve banks' liquidity absorption capacity for liquidity shocks (BCBS, 2011).

The Net Stable Funding Ratio, on the other hand, has a negative correlation with bank stability. This implies that banks' profitability and asset allocation may be negatively affected by the tougher long term funding conditions. A higher level of stable funding may lead to higher funding costs and lower flexibility in lending, slightly lowering the earnings capacity and thus the Z Score. Similar conflicting results were found by earlier research with regards to the effect of NSFR on bank performance and stability, especially in less developed funding markets of emerging banking systems (Repullo&Saurina, 2011; Iqbal et al., 2021). Efficiency continues to be positively related to bank stability in both models, but the impact of efficiency on bank stability is reduced when compared with previous estimates. This suggests that cost efficient banks still have higher levels of financial resilience, even once adjusted for the effect of regulatory liquidity requirements. Efficient institutions can control operating expenses and sustain consistent earnings, thus enhancing their solvency (Berger & DeYoung, 1997; Fiordelisi et al., 2011).

At the macroeconomic level, conditions are also negatively affecting bank stability. The two models indicate negative relationship between GDP growth and the expansion of bank lending, indicating that banks may be more willing to lend in economic expansion periods, potentially exposure to credit risk. The mixed effects of inflation appear in both specifications as do the dynamics of inflation and monetary policy. In general, the extended results suggest that Basel III liquidity requirements have a significant impact on the stability of banks. Adding regulatory liquidity indicators diminishes the importance of some of the traditional bank level variables and emphasizes the importance of regulatory liquidity buffers to enhance financial resilience. The results highlight that the prudential regulation based on Basel III has become a significant factor in the stability of banking sector in Pakistan.

Table 8.3 Base Model with BASEL III ZScore = Operational Risk

Variables	**Model 3.1**	**Model 3.2**
ZScore	0.356 (0.129)***	0.207 (0.168)
CRR	-0.92* (0.231)***	-
LIR	-	-0.137 (0.022)***
CAR	0.001 (0.002)***	-0.002 (0.006)***
LQD	-0.028 (0.026)	-0.038 (0.031)
EFF	0.063 (0.204)***	0.057 (0.025)**

CAP	0.109 (0.143)	0.069 (0.144)
LCR	0.002 (0.004)***	0.001 (0.004)***
NSFR	-0.002 (0.001)***	-0.002 (0.001)*
GDP1	-0.042 (0.021)**	-0.079 (0.028)***
INFR	-0.042 (0.016)***	0.079 (0.013)***
CONST	4.929 (1.668)***	2.524 (1.243)**

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Source: Author's Estimation

The extended models with the inclusion of Basel III liquidity requirements along with profitability are shown in Table 8.4. As in the previous specification, Model 4.1 takes the ratio of the cash reserve as the monetary policy indicator and Model 4.2 takes the lending interest rate. By using these models, we will be able to explore the role of regulatory liquidity requirements on bank stability, taking into account profitability as one of the bank-specific factors. Important modification of these models is that the lagged Z Score no longer has any statistical importance. With the disappearance of the persistence in bank stability, adding profitability and Basel III regulatory indicators together reduces the dynamic effect of past stability. It suggests that current financial conditions as reflected in regulatory liquidity needs and bank profitability are more significant factors in bank stability than previous financial conditions. The Z Score, which shows a correlation with past performance, was not found to be as persistent as it was in the past, which may be due to Basel III reforms to address liquidity risk management and the lessened reliance on past performance in the balance sheet (BCBS, 2011; Gambacorta& Shin, 2018).

Monetary policy variables continue to show a negative and statistically significant relationship with bank stability. The results of Model 4.1 indicates that the cash reserve ratio had a strong negative relationship with the Z Score, which indicates that increasing the cash reserve ratio reduces the stability of banks. In the same way, the interest rate charged on loans has a negative and significant coefficient in Model 4.2. The higher the interest rate, the higher the cost of borrowing and can reduce the ability to repay the loan, potentially causing deterioration in the quality of the loans and reduced financial resilience of banks. These findings corroborate the risk taking channel literature that shows that monetary tightening can affect bank stability by affecting borrower balance sheets and credit conditions (Borio& Zhu, 2012; Maddaloni&Peydró, 2011). These models include profitability as an important factor. An increase in ROE is positively and statistically significant related to a higher Z Score for both specifications. This means that the more profitable a bank is, the more stable it will be. The higher the profits, the more capital that can be generated internally, and the more cushion that can be provided against the loss of capital. Profitable banks can thus react more easily to economic shocks and remain solvent. This finding is in line with previous research finding that better earnings are correlated with greater financial stability and reduced risk of distress in banks (Berger &Bouwman, 2013; Zheng et al., 2023).

This is also the case for bank stability, which is still positively related to capitalization. The positive and significant coefficient implies that a bank with a higher ratio of equity to liabilities is further away from insolvency. Increased capital buffers also help to buffer bank losses and boost confidence in the banking system. It is in line with the theoretical expectation that better capital structures help enhance financial resilience and lessen the odds of a bank failure (Laeven& Levine, 2009). However, the inclusion of Basel III indicators results in some variables changing from being significant in earlier models to insignificant. For example, the liquidity dimension is not important in Model 4.1 but is important in Model 4.2. This change can happen because the Basel III liquidity ratios (LCR and NSFR) are more direct measures of liquidity risk than traditional

liquidity ratio. These regulatory indicators, once added to the explanatory power of the simple liquidity ratio is reduced because regulatory liquidity buffers already reflect the capacity of the banks to resist funding shocks (Giordana& Schumacher, 2017).

Likewise, the LCR is no longer significant in Model 4.1 but is still weakly significant in Model 4.2. This indicates that short-term liquidity buffers could be stabilization mechanisms sensitive to the channel of the monetary policy. If the policy is implemented via interest rates, spanner-like liquidity buffers seem to have a clearer impact on financial stability. The Net Stable Funding Ratio is mixed across the models as it relates to the balance between funding stability and profitability pressures. Stable long term funding can make funding more expensive, and this can impact earnings capacity in some banking systems (Repullo&Saurina, 2011). Macroeconomic conditions remain to be a factor in bank stability. The Z Score has a negative relationship with GDP growth in both specifications. This could indicate the risk of banks being more proactive in their lending activity during economic expansions, thus being exposed to higher risk borrowers. The results of these models indicate that bank stability has a positive correlation with inflation, indicating that moderate inflation could lead to higher nominal earnings and better bank profitability, thus enhancing financial resilience.

Taking both Basel III liquidity requirements and profitability into account together, the results show a clear shift in the determinants of bank stability overall. The regulatory liquidity indicators partially fill the void of the traditional balance sheet indicators that explain stability, while the profitability and capitalization are important factors that explain financial resilience. The results emphasize the growing role of prudential regulation in the future stability of banks in the post-Basel III regulatory framework.

Table 8.4 Base Model with Basel III ZScore = Market Risk

Variables	**Model 4.1**	**Model 4.2**
ZScore	-0.018 (0.047)	0.026 (0.039)
CRR	-1.006 (0.134)***	-
LIR	-	-0.059 (0.024)***
CAR	0.006 (0.001)	-0.0008 (0.0003)***
LQD	-0.116 (0.020)	-0.068 (0.019)***
ROE	0.091 (0.011)***	0.114 (0.013)***
CAP	0.253 (0.057)***	0.311 (0.067)***
LCR	0.002 (0.004)	0.013 (0.003)*
NSFR	0.001 (0.008)**	0.002 (0.007)
GDP1	-0.178 (0.059)***	-0.281 (0.019)**
INFR	0.046 (0.009)***	0.022 (0.013)*
CONST	5.012 (0.840)***	0.018 (0.729)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Source: Author's Estimation

Interaction Models Monetary Policy and Basel III

Table 8.5 provides details on the models of interaction considered, which explore the possibility of interaction between monetary policy and bank stability that is mediated by Basel III liquidity

requirements. This interaction term between monetary policy and Basel III indicators is added to account for the interaction between the impact of monetary policy on the Z Score and the regulatory liquidity requirements. The monetary policy indicator for Model 5.1 is the cash reserve ratio, and for Model 5.2 is the lending interest rate. The coefficient on the lagged Z Score is still positive and significant in both specifications, indicating continued bank stability over the time period. This suggests that banks that are in a better financial position in the previous period have a greater probability of being stable in a following period. The overall persistence of such indicators is characteristic of how bank balance sheets and the nature of their lending relationships tend to adjust over time, as is typical in empirical banking studies (Berger & DeYoung, 1997).

The negative and statistically significant relationship of monetary policy variables and bank stability remains unchanged. The risk of Model 5.1 is very high as the Cash Reserve ratio has an adverse impact on the Z Score value, meaning that the higher the CRR, the less liquid are the banks, and their loan provisioning is also reduced. Likewise, lending interest rate in Model 5.2 has a negative coefficient, which is very significant. Raising lending rates can lead to higher borrowing costs and lower repayment ability for borrowers and could contribute to loan quality deterioration and ultimately to a lower bank stability. The results are consistent with the risk taking channel of monetary policy, which posits that monetary policy affects the risk of bank balance sheets and the financial resilience of banks (Borio& Zhu, 2012; Maddaloni&Peydró, 2011).

The interaction term between monetary policy and Basel III is significant evidence of the ‘moderating effect' of prudential regulation. For Model 5.1, the interaction coefficient is positive and statistically significant, suggesting that Basel III liquidity requirements have a positive impact on bank stability that mitigates the adverse impact of reserve requirements on bank stability. The latter indicates that more stringent reserve policies have less destabilizing effect on the economy when regulators have higher liquidity buffers. The interaction term in Model 5.2 is negative and statistically significant, suggesting that a more stringent liquidity requirement can exacerbate the negative impact of banks' higher lending rates on their stability when monetary policy is transmitted through the interest rate channel. The difference points to the fact that regulatory liquidity requirements have different impacts on the different monetary policy channels, as highlighted in the macroprudential literature (Gambacorta& Shin, 2018).

In terms of the relationships of each of the regulatory indicators with the Z Score, a positive and statistically significant relationship was observed for both models in the Liquidity Coverage Ratio. This suggests that the greater the short term liquidity buffers, the more stable the bank, as banks have more high quality liquid assets to buffer against funding shocks. These models make the Net Stable Funding Ratio statistically insignificant. There is the possibility that the interaction term explains a lot of the combined effects of monetary policy and regulatory funding conditions and that the direct effect of long term funding stability is lessened. The efficiency and liquidity continue to have a positive relationship with bank stability, with cost efficient banks and institutions with a strong liquid asset position able to endure financial stress to a greater extent. Compared to that, capitalization is no longer relevant, perhaps because the new Basel III indicators of bank stability are more closely related to the importance of regulatory liquidity requirements.

Overall, the interaction models offer valuable lessons on the part played by prudential regulation. These findings indicate that Basel III liquidity requirements have an important impact on the relationship between monetary policy and bank stability. The effects of the interplay between regulatory liquidity buffers and interest rate changes seem more complicated and the destabilizing impact of reserve based monetary policy is tempered. The results show the need for close

cooperation between monetary and macroprudential policies in ensuring financial stability in bank based financial systems.

Table 8.5 Base Model with MP*BASEL III ZScore = Operational Risk

Variables	Model 5.1	Model 5.2
ZScore	0.472 (0.141)***	0.295 (0.142)**
CRR	-1.617 (0.291)***	-
LIR	-	-0.117 (0.024)***
CAR	0.003 (0.008)	0.001 (0.0002)***
LQD	0.087 (0.034)***	0.066(0.029)**
EFF	0.065 (0.031)**	0.079 (0.033)**
CAP	-0.099 (0.103)	-0.002 (0.129)
GDP1	-0.044 (0.018)***	-0.084 (0.019)***
INFR	0.147 (0.019)***	-0.087 (0.012)***
LCR	0.002 (0.001)***	0.011 (0.004)***
NSFR	-0.001 (0.016)	-0.001 (0.009)
MP*Basel III	0.148 (0.011)***	-0.062 (0.015)***
CONST	7.504 (1.635)***	1.389 (1.114)

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Source: Author's Estimation

Table 8.6 shows the interaction models that include Basel III liquidity requirements along with profitability. The monetary policy indicator used is the same as in the previous specifications: the cash reserve ratio in Model 6.1 and the lending interest rate in Model 6.2. These models investigate if Basel III regulations moderate the relationship between bank stability and the monetary policy, taking into account bank profitability.Bank stability shown by the lagged Z Score is statistically significant and continues to be positive in both models. This indicates that banks which have more robust financial positions in the past are likely to be more stable in the current period. This persistence would seem to be a reflection of a gradual adjustment of bank balance sheets and risk management practices over time (Berger & DeYoung, 1997).

Monetary policy variables still exhibit a negative and significant association with bank stability. In Model 6.1, the cash reserve ratio has a significant impact on the Z Score, which would suggest that the higher the cash reserve ratio, the more unstable the bank is due to a smaller amount of liquid assets that can be used for loans. In the same way, the lending interest rate displayed in model 6.2 has negative and very significant impact on Z Score. The increasing interest rates affect the affordability of borrowers' debt service and increase the cost of borrowing, potentially leading to a decrease in loan quality and bank stability. The findings are consistent with those in the literature, which attribute the monetary policy risk taking channel to this channel (Borio& Zhu, 2012; Maddaloni&Peydró, 2011).

Further insights can be gained from the interaction term between monetary policy and Basel III. The interaction between Basel III liquidity standards and the negative effect of reserve requirements on bank stability is positive and statistically significant in Model 6.1. This indicates that the ability of banks to withstand crises would improve and the adverse effect of restrictive policies would fall. But the interaction term is not statistically significant in Model 6.2. This transition process could be a sign that the "moderating" effect of Basel III is reduced when monetary policy works by means of interest rates. The effect of changes in interest rates is mainly

on the balance sheet of borrowers and on the demand for credit, thereby potentially limiting the direct effects of regulatory liquidity buffers on bank stability.

Profitability has mixed effects when applied to the two models. In Model 6.1, negative relations between return on equity and Z Score indicates that banks with higher ROE could be more at risk, hence have a smaller distance from the insolvency zone. The coefficient, however, becomes positive and meaningful in Model 6.2, which means that interest rate based monetary policy can more readily support profitable banks' stability. The disparities illustrate how profitability and bank stability are linked: profitability may be a sign of good financial conditions, or of higher risk exposure (Laeven& Levine, 2009; Zheng et al., 2023).

The Liquidity Coverage Ratio is a regulatory indicator that is of little importance in Model 6.1 but is important in Model 6.2. This could imply that the stabilizing effect of the short term liquidity buffers becomes more important when monetary policy is implemented via interest rate measures. In both models, the Net Stable Funding Ratio is statistically insignificant after the interaction term of monetary policy and Basel III, suggesting that the direct impact of long term funding stability could be captured by this interaction item. Overall, the findings validate that Basel III liquidity requirements are a moderating influence on the effect of monetary policy on bank stability, but the impact on bank stability is different across monetary policy channels. The results indicate the value of monetary and prudential policies to ensure financial stability in banking sector.

The detailed evidence above on the effect of monetary policy, regulatory standards and bank specific characteristics on financial stability is provided empirically. The results are summarized in the following section and the economic implications discussed.

Table 8.6 Base Model with MP*Basel III ZScore = Market Risk

Variables	Model 6.1	Model 6.2
ZScore	0.241 (0.071)***	0.078 (0.053)*
CRR	-1.017 (0.201)***	-
LIR	-	-0.173 (0.028)***
CAR	0.0001 (0.0002)***	0.0006 (0.00007)***
LQD	0.063 (0.035)*	-0.026 (0.017)
ROE	-0.097 (0.007)***	0.100 (0.013)***
CAP	-0.324 (0.157)**	-0.002 (0.045)
GDP1	-0.039 (0.009)***	-0.051 (0.011)***
INFR	0.057 (0.013)***	0.035 (0.015)**
LCR	0.0004 (0.001)	-0.007 (0.003)**
NSFR	-0.001 (0.001)	-0.002 (0.005)
MP*Basel III	0.083 (0.016)***	0.016 (0.015)
CONST	6.685 (1.492)***	1.611 (0.581)***

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Source: Author's Estimation

Key Findings

Monetary Policy and Bank Stability

The empirical findings show that the monetary policy has significant impact on bank stability in Pakistan. In most specifications, the cash reserve ratio is negatively and significantly related to the Z Score. The implication of this is that the tighter the reserve requirement, the less stable the banks

will be because they will have less liquidity and will not be able to increase lending. Reduced liquidity can bring challenges to the profitability and balance sheet flexibility of banks, thus lowering their financial resilience. Restrictive liquidity policies are documented to have an impact on banks' intermediation and stability, for instance in the banking literature (Borio& Zhu, 2012; Maddaloni&Peydró, 2011).

Several models also reveal a negative and significant relationship between the lending interest rate and bank stability. An increase in the interest rate charged on loans raises the cost of borrowing for firms and households, potentially reducing their borrowing capacity and making it more likely that they default on their loans. This could lead to a decline in the quality of banks' loan books, bringing them closer to insolvency. The results in this paper validate the impact of monetary policy not only on the amount of bank lending, but also on financial stability, in line with the existence of the monetary policy risk taking channel in the banking sector (Ioannidou et al., 2015; Dell'Ariccia et al., 2017).

Role of Bank Specific Characteristics

Financial stability is also affected by the characteristics of the banks themselves. There is some evidence of positive relationship between Operational efficiency and the Z Score in some model specifications, suggesting that more efficient banks tend to have higher Z Score. Finely-managed banks are more likely to have efficient operations, manage borrowers, and have better asset quality. This result aligns with the efficiency risk hypothesis that posits that more efficient institutions suffer less financial distress (Berger & DeYoung, 1997; Fiordelisi et al., 2011).

When assessing profitability by return on equity, both positive and negative results are observed in the models. However, there are some specifications which have a negative relationship between profitability and bank stability; that is, banks with more unstable balance sheets may be engaged in riskier lending practices. In other models, however, profitability adds positively to stability, reflecting the importance of profitability in bolstering capital buffers and enabling prudent risk management. The banks' equity position and their capitalization level generally have a positive relationship, which means that banks with a higher equity position are better able to absorb potential losses and keep their banks solvent in times of financial stress (Berger &Bouwman, 2013).

Basel III Liquidity Standards and Bank Stability.

Basel III liquidity indicators add to the understanding of factors that influence the stability of banks. In most specifications, LCR is positively associated with the Z Score, indicating that higher short term liquidity buffers are associated with higher bank resilience. The LCR strengthens the banks' ability to resist short term funding shocks and limits their financial distress by demanding them to hold high quality liquid assets.

There were mixed signals from the models in the Net Stable Funding Ratio. However, in certain instances, the variable is not statistically significant when other regulatory and bank specific controls are added. This could be a reflection of stability effects of long term funding structures being partially reflected in other balance sheet variables (capitalization and liquidity). Results from previous studies also indicate that Basel III funding requirements add to the resilience of banks, but that the impact of these requirements on resilience can differ across banking systems and regulatory environments (Gambacorta& Shin, 2018).

Moderating Effect of Basel III

One of the main challenges of this research is the study of the interaction between Basel III regulations and monetary policy. The interaction terms in the extended models show that regulatory liquidity requirements are related to the way monetary policy affects bank stability. The regulatory liquidity buffers experienced in several specifications are statistically significant, indicating that increased buffers have a dampening effect on the destabilizing impacts of monetary policy changes.

In particular, banks with higher liquidity buffers seem to be better positioned to withstand liquidity shocks from a change in the reserve requirement. The moderating effect of Basel III is less apparent in the context of monetary policy having a direct impact on the interest rate. Basel III affects interest rates less directly than it affects liquidity conditions in banks' balance sheets; thus, interest rate changes mainly affect the balance sheets of borrowers rather than those of banks. This emphasizes the need to take into account financial, as well as regulatory frameworks, when examining bank stability.

Macroeconomic Conditions

Bank stability is also influenced by macroeconomic factors. In a number of specifications, economic growth has a negative relationship with the Z score, indicating that the banks might find it easier to increase their lending during economic booms. Credit expansion helps to stimulate the economy, but can lead to more risk-taking borrowers and a less stable banking system if the credit standards become lax in the expansion phases of the business cycle.

The models have mixed results in their appearance of inflation. Some specifications involve inflation diminishing the ability of the lender, or borrower, to be repaid: in this case, inflation decreases the ability of borrowers to be repaid and, thus, decreases the stability of the bank. In other instances, inflation seems to make bank margins better by means of higher nominal interest rates, which might make financial conditions briefly better. The findings point to the intricate relationship among macroeconomic fluctuations, monetary policy and the performance of the banking sector.

Summary of Key Findings

In summary, the empirical outcomes suggest that the impact of the three factors – monetary policy, bank-specific characteristics, and the regulatory environment – is interconnected, affecting bank stability in Pakistan. This shows that banks have a risk taking channel, as monetary policy instruments affect bank stability both in the liquidity channel and the interest rate channel. Bank efficiency, capitalization, and profitability also are important to financial resilience and Basel III is a way to build banks' liquidity resilience and their capacity to absorb liquidity shocks. Importantly, the interaction models reveal that regulatory liquidity buffers can cushion the effects of monetary policy, suggesting that the direct implementation of monetary policy and that of macroprudential policy are complementary in ensuring financial stability in a bank-dominated financial system.

The main findings suggest that monetary policy, regulatory liquidity requirements, and bank characteristics are important factors in determining the financial stability of Pakistan. Based on these findings, the overall findings and policy recommendations of the study are summarized below.

Conclusion and Policy Recommendations

This study covered the impact of monetary policy and bank stability in Pakistan in presence of moderating role of Basel III liquidity regulations. A panel dataset consisting of 21 commercial banks for the sample of 2012–2023 was employed for the analysis. The two-step System Generalized Method of Moments (SGMM) dynamic panel methodology was used to cope with endogeneity, persistence and unobserved heterogeneity in banking data.The empirical results suggest that monetary policy has a significant impact on bank stability of Pakistan. In most specifications the cash reserve ratio and the lending interest rate are negatively correlated with the Z Score. The findings indicate that the tighter the monetary conditions the less the banks would be stable, resulting in a decrease in liquidity and also a rise in cost of borrowing for firms and households. Banks' loan portfolios can become of poor quality as liquidity tightens or borrowers' interest increases, thereby decreasing banks' distance from insolvency.

The financial stability of the bank also depends on some of its individual features. Operational efficiency is positively related to bank stability, suggesting that well-managed banks can better manage their costs and asset quality. In a few specifications, profitability and capitalization help to explain stability, meaning that banks that are more profitable and capitalized are better able to withstand shocks and to maintain prudent lending practices. Basel III's liquidity indicators add to the understanding of the regulatory aspect of financial stability. The Liquidity Coverage Ratio is typically used to enhance the stability of banks, to boost their short term liquidity buffers. The Net Stable Funding Ratio indicates mixed impacts, potentially meaning that long term funding needs can affect bank stability differently under varying balance sheet circumstances and markets.

One of the main findings of the study is the study of the interaction between the Basel III regulation and monetary policy. The interaction results indicate that the effects of monetary policy on financial stability of banks can be dampened by regulatory liquidity buffers. Banks with more liquidity buffers are likely to be better prepared to withstand liquidity shocks arising from the policy. This discovery underscores the need for macroprudential regulation as a key component for the resilience of the banking system. In general, the findings suggest that all the above factors together have an impact on the stability of the Pakistani banking system. The results highlight the importance of coordination between monetary and prudential policies to ensure financial stability in a bank dominated financial system.

Policy Recommendations

From the empirical results, there are some policy recommendations that can be made for the monetary authorities, banking regulators and financial institutions.

Financial authorities should take the impact of monetary policy on bank stability into account in formulating monetary policy decisions. Adjustments to the reserve requirements and interest rates charged on credit affect banks' financial strength and the volume of credit. Policymakers should thus be mindful of indicators of the banking sector in making a monetary tightening or monetary easing policy.

Second, the results highlight the importance of Basel III liquidity regulations in strengthening financial stability. The State Bank of Pakistan should remain vigilant in ensuring efficient implementation and monitoring of liquidity ratios, including the LCR and NSFR. Liquidity buffers that are robust can cushion financial shocks and lessen the risk of instability during times of monetary adjustment.

Third, the regulators should encourage better risk management in banks. Operational efficiency, liquidity and capital planning improvements can greatly increase the stability of financial

institutions. Supporting banks in deploying more up-to-date risk management systems and governance structures can help build the resilience of the banking sector further.

Fourth, there is a need to have a coordinated policy mix between monetary policy and macroprudential regulation. Financial stability concerns can be beyond the scope of monetary policy. The use of monetary policy alongside regulatory measures like liquidity requirements, capital buffers, and stress testing regimes can offer a more comprehensive strategy for financial risk management.

Last but by no means least, condition of the macroeconomy must be monitored continuously. The stability of banks is influenced by the dynamics of economic growth and inflation because they affect the credit demand and the ability of the borrowers to repay the loans. This can, in turn, help to make the banking system more stable and resilient.

Finally, it is essential to have a well-balanced policy framework in Pakistan that combines monetary policy, regulatory control, and good bank management practices to ensure financial security. Going forward, policymakers, the regulator and financial institutions must work together to build a stable and resilient banking sector.

References

1. Agur, I., &Demertzis, M. (2010). Monetary policy and excessive bank risk taking. *De Nederlandsche Bank Working Paper*.
2. Akhter, S. (2023). Monetary policy and bank risk taking: Evidence from Pakistan's banking sector. *Journal of Financial Regulation and Stability*.
3. Altunbas, Y., Gambacorta, L., &Marqués-Ibáñez, D. (2010). Bank risk and monetary policy. *Journal of Financial Stability*, 6(3), 121–129.
4. Altunbas, Y., Liu, M. H., Molyneux, P., & Seth, R. (2007). Efficiency and risk in Japanese banking. *Journal of Banking and Finance*, 31(3), 733–749.
5. Anwar, M., Khan, S., & Ali, R. (2023). Monetary policy transmission through bank lending in Pakistan. *Economic Modelling*.
6. Arellano, M., &Bover, O. (1995). Another look at the instrumental variable estimation of error components models. *Journal of Econometrics*, 68(1), 29–51.
7. Basel Committee on Banking Supervision. (2011). *Basel III: A global regulatory framework for more resilient banks and banking systems*. Bank for International Settlements.
8. Basel Committee on Banking Supervision. (2010). *Basel III: International framework for liquidity risk measurement, standards and monitoring*. Bank for International Settlements.
9. Berger, A. N., &Bouwman, C. H. S. (2013). How does capital affect bank performance during financial crises? *Journal of Financial Economics*, 109(1), 146–176.
10. Berger, A. N., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. *Journal of Banking and Finance*, 21(6), 849–870.
11. Berger, A. N., &Mester, L. J. (1997). Efficiency and productivity change in the U.S. commercial banking industry. *Journal of Banking and Finance*, 21(6), 895–947.
12. Bernanke, B. S., &Gertler, M. (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives*, 9(4), 27–48.
13. Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.
14. Bordeleau, É., & Graham, C. (2010). The impact of liquidity on bank profitability. *Bank of Canada Working Paper*.

15. Borio, C., &Gambacorta, L. (2017). Monetary policy and bank lending in a low interest rate environment. *Journal of Financial Stability*, 31, 193–206.
16. Borio, C., & Zhu, H. (2012). Capital regulation, risk taking and monetary policy: A missing link in the transmission mechanism? *Journal of Financial Stability*, 8(4), 236–251.
17. Čihák, M., & Hesse, H. (2010). Islamic banks and financial stability: An empirical analysis. *Journal of Financial Services Research*, 38(2–3), 95–113.
18. Dell'Ariccia, G., Laeven, L., & Suarez, G. (2017). Bank leverage and monetary policy's risk taking channel: Evidence from the United States. *Journal of Finance*, 72(2), 613–654.
19. Fiordelisi, F., Marques-Ibanez, D., &Molyneux, P. (2011). Efficiency and risk in European banking. *Journal of Banking and Finance*, 35(5), 1315–1326.
20. Gambacorta, L. (2009). Monetary policy and the risk taking channel. *BIS Quarterly Review*, December.
21. Gambacorta, L., & Shin, H. S. (2018). Why bank capital matters for monetary policy. *Journal of Financial Intermediation*, 35, 17–29.
22. Giordana, G., & Schumacher, I. (2017). An empirical study on the impact of Basel III liquidity standards on banks' stability. *Journal of Banking Regulation*, 18(2), 173–188.
23. Hussain, M., Ahmad, S., & Khan, A. (2021). Monetary policy and bank performance in Pakistan. *Pakistan Economic Review*.
24. Ioannidou, V., Ongena, S., &Peydró, J. L. (2015). Monetary policy, risk taking, and pricing: Evidence from a quasi natural experiment. *Review of Finance*, 19(1), 95–144.
25. Iqbal, J., Strobl, S., &Vähämaa, S. (2021). The role of liquidity regulation in bank stability. *Journal of Financial Stability*, 53.
26. Jiang, L., & Yuan, R. (2022). Monetary policy, banking regulation, and risk taking: Evidence from China. *Emerging Markets Finance and Trade*, 58(6), 1738–1754.
27. Jiménez, G., Ongena, S., Peydró, J. L., &Saurina, J. (2014). Hazardous times for monetary policy: What do twenty three million bank loans say about the effects of monetary policy on credit risk taking? *Econometrica*, 82(2), 463–505.
28. Khan, M. A. (2022). Inflation dynamics and monetary policy in Pakistan. *Pakistan Development Review*.
29. Khan, M., Ahmad, N., & Ali, S. (2016). Interest rate pass through in the Pakistani banking sector. *State Bank of Pakistan Working Paper*.
30. Laeven, L., & Levine, R. (2009). Bank governance, regulation and risk taking. *Journal of Financial Economics*, 93(2), 259–275.
31. Maddaloni, A., &Peydró, J. L. (2011). Bank risk taking, securitization, supervision, and low interest rates. *Review of Financial Studies*, 24(6), 2121–2165.
32. Rahman, M., Shah, S., & Ahmad, I. (2015). Economic growth and financial sector development in Pakistan. *Economic Modelling*.
33. Repullo, R., &Saurina, J. (2011). The countercyclical capital buffer of Basel III: A critical assessment. *CEPR Discussion Paper*.
34. Ridwan, M., &Mayapada, A. (2022). Capital adequacy and financial stability in the banking sector. *International Journal of Financial Studies*.
35. Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71(1), 135–158.
36. Rubio, M., & Carrasco-Gallego, J. A. (2016). The interaction between monetary policy and macroprudential regulation. *International Journal of Central Banking*, 12(3), 215–252.
37. Roy, S., Ahmed, F., & Hasan, R. (2023). Monetary policy instruments and banking stability in emerging markets. *Journal of Economic Policy*.
38. Vázquez, F., & Federico, P. (2015). Bank funding structures and risk: Evidence from international banking. *Journal of Banking and Finance*, 61, 1–14.

39. Zheng, C., Rahman, M., Begum, M., & Ashraf, B. (2017). Bank stability, risk taking, and competition. *Economic Systems*, 41(3), 442–457.
40. Zheng, C., et al. (2023). Banking stability and profitability dynamics in emerging markets. *Journal of Financial Stability*.