

Article

Assessing Basel Capital Regulations: Exploring the Risk and Efficiency Relationship in Emerging Economies

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Abstract: This research investigates the relationship between Basel capital regulations, bank risk, and bank efficiency in the context of Pakistani and Indian commercial banks. This study examines the period from 2009 to 2022 and specifically analyses the impact of Basel III capital requirements on risk and efficiency. Quantitative methods are employed, utilising data from central bank websites and the BankScope database to construct a comprehensive sample of commercial banks in Pakistan and India. The system-generalised method of moments (GMM) estimation technique addresses potential endogeneity issues in the regression models. The findings shed light on the effectiveness of these regulations and provide insights for policymakers and regulators in both countries. The results indicate that Basel capital regulations have generally increased banks' risk-taking behaviour in Pakistan and India. However, they have not improved the overall efficiency of the banking sector in either country. Bank efficiency declined during the study period, highlighting the limited effectiveness of Basel capital regulations in enhancing efficiency. Furthermore, the impact of these regulations on risk and efficiency varies between the two countries. In Pakistan, the regulations do not significantly affect bank efficiency, while in India, they decrease efficiency. Additionally, Basel III capital regulations do not significantly impact the risk taken by banks in either country. This study concludes by emphasising the need for alternative mechanisms or policies to improve the banking industry's efficiency, as Basel capital regulations alone have proven ineffective. The findings offer valuable insights for central banks and regulators in assessing the relationship between capital regulations, risk, and efficiency and implementing appropriate measures to enhance the performance of the banking sector. This study recommends the following key points: the adoption of tailored regulatory approaches to address specific challenges, achieving an optimal balance between risk management and operational efficiency, enhancing the effectiveness of management roles, considering the influence of macroeconomic factors, and evaluating the implications of long-term policy development for sustainable progress. The present study adds to the prevalent literature on the impact of capital regulations on bank risk and efficiency nexus. This study focuses on Pakistan and India, which are two important developing nations. Moreover, another important contribution of this study lies in the effect of Basel III capital regulation on bank risk, as these capital regulations are different from other Basel capital requirements.

Keywords: Basel capital regulations; bank risk; bank efficiency; Pakistani and Indian commercial banks

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1. Introduction

Financial institutions are key economic players due to their role in financial intermediation (Karim et al., 2010). The bank takes deposits and disburses loans, and it makes money from the spread between the interest rates it charges and pays to depositors and borrowers, respectively. Banks are the economy's most important financial intermediary because they connect deficit and surplus economic units. In emerging and transition economies, a well-functioning banking sector has been recognised as an engine of economic expansion and prosperity (La Porta et al., 2002).

A key issue in the literature on bank capital laws is how capital regulations affect banks' willingness to take risks. Mitchell (1986) believes that the increase in bank involvement in risky activities escalates the chance of bank defaults at the micro level and raises concerns about the long-term stability of the financial system at the macro level. Hence, policymakers have curbed the motivation to take on too much risk by making capital regulation a crucial component of the prudential regulatory process. Non-performing loans (NPLs) are one of the contributors to economic crises. Brownbridge (1998) declares increasing NPLs as the major reason for bank failures. The high ratio of NPLs may not allow banks to generate sufficient income, thus increasing costs and reducing efficiency and negatively impacting the country's economy (Adebolaa & Dahalan, 2011). India and Pakistan have had significant non-performing loans (NPLs) during the last decade. Pakistan's banking sector was on the verge of default due to the rise in bad debt (Khan & Khan, 2007). According to the State Bank of Pakistan (2011) Quarterly Performance Review of the Banking Sector, the average value of non-performing loans for Pakistan was 11.43%, with a minimum of 7.3% in 2006 and a maximum of 16.21% in 2011.

Similarly, non-performing loans have become a shocking threat to the banking business in India, sending disturbing signals about the durability and sustainability of the affected banks in the last decade or so. Currently, the Indian bank sector is stressed by growing NPLs, with gross non-performing loans accounting for 7.5% of banks' overall outstanding loan collection in the fiscal year ending March 2016. In the last five years, India's ratio of NPLs to gross loans has shown a sharp rise of over 9%, based on the data of the Reserve Bank of India annual report (2017). Compared to other emerging economies, the present condition of the Indian banking sector shows a dismal state concerning NPL (Sengupta & Vardhan, 2017). The growing trend in NPLs in both these countries triggers the curiosity of researchers.

Since their independence from British rule in 1947, both countries' financial sectors have undergone a similar transformation. Moreover, the liberalisation of the financial sector in India and Pakistan started simultaneously, i.e., in 1990, to decrease risk and enhance efficiency. India and Pakistan have implemented the Basel capital regulations to enhance the security and reliability of the banking sector approximately simultaneously during the last decade of the 20th and the first decade of the 21st century. Though both countries have implemented Basel I and II regulations, the transition to Basel III is a complex process that requires banks to change their risk management procedures and increase their capital reserves. The Reserve Bank of India (RBI) had set a deadline for the full implementation of Basel III for the end of the financial year 2019–2020. However, in light of the COVID-19 pandemic and the resulting economic uncertainty, the RBI in 2020 extended the deadline for full implementation to 1 October 2021. The implementation process involved a phased-in approach, and the RBI released multiple guidelines to assist banks with this transition. As for Pakistan, the State Bank of Pakistan (SBP) has also been moving toward implementing Basel III. The SBP had also chosen a phased approach, with a deadline for full implementation initially set for the end of 2020. However, the COVID-19 pandemic has affected this timeline, like in India.

De Guevara et al. (2007) state that Europe and America have abundant literature on capital, risk, and efficiency. However, the literature focusing on emerging markets is not as abundant. Moreover, most bank risk and efficiency research is cross-sectional, focusing on specific time snapshots. This approach can provide valuable insights but is limited in capturing the evolving dynamics of banking behaviour over extended periods. This study makes its contribution in many ways. According to the researcher, this is one of few studies investigating the capital, risk, and efficiency nexus in the banking sector of two emerging markets, i.e., India and Pakistan. The unique challenges like higher volatility in capital flows, regulatory inconsistencies, and specific socioeconomic conditions posed by the banking sectors in these developing economies provide a strong case for researching this interplay of capital, risk, and efficiency. The country-wise quantification, i.e., India and Pakistan, of the effect of different capital regulations concerning risk and efficiency makes the second contribution of this study. Despite similarities like obtaining independence simultaneously, there is a great deal of disparity in population, no. of commercial banks, and access to banks by the common person (India has a very high ratio compared to Pakistan). So, this country-specific insight is valuable for regulators and policymakers in tailoring contextually relevant strategies. Another contribution of this study is that it investigates the change in the capital regulations, risk, and efficiency relationship with Basel III implementation time, as capital requirements in the Basel III accord were increased to 10.5% from 8% (Basel III accord). This study adopts a longitudinal approach to spread the transition gap from Basel II to Basel III over 13 years (2009–2022). This extended time frame allows us to observe the immediate and long-term impacts of capital regulations on the bank risk and efficiency framework, thus offering a more comprehensive view. Thus, the focus on Pakistani and Indian banks, the longitudinal analysis across the Basel accords, and the consideration of management efficiency as a mediating variable are some of the unique contributions this study aims to make.

This study will contribute to the academic discourse and provide practical insights for regulators and policymakers. The central banks of both countries will be able to determine the capability of capital requirements in reducing risk and enhancing efficiency with this study's findings. This study will develop a more holistic understanding of the factors affecting bank risk and efficiency, particularly in the nuanced contexts of developing economies like Pakistan and India. Also, it will make it easier for the administration of the central banks of both nations to develop and practise appropriate procedures for improving the banking sector both globally and locally. This study acknowledges that Basel III was initially scheduled for full implementation in 2019 but was postponed due to the COVID-19 pandemic. Therefore, while this study covers the period from 2009 to 2022, it is crucial to understand that Basel III's impact is not straightforward.

2. Literature Review

The subject of bank risk and efficiency forms a cornerstone in banking and financial regulation discourse. The complexity arises from the multidimensional nature of "risk" and "efficiency" and the evolving landscape of global banking regulations, epitomised by the Basel Accords. This expanded literature review aims to comprehensively examine the theoretical frameworks, empirical evidence, and regulatory aspects affecting the risk–efficiency relationship in banking. It also identifies the gaps the present study aims to fill, particularly in Pakistani and Indian banks. Several studies have discussed the association between Basel capital regulations, risk, and efficiency. However, the research gap this research addresses is the relationship between Basel capital regulations, bank risk, and bank efficiency in the context of Pakistani and Indian commercial banks. While previous studies have explored this nexus, the empirical findings have been heterogeneous, leading

to a lack of consensus. The theoretical underpinnings of this study can be found in moral hazard agency theory and efficiency structure. Originating from the insurance sector, the concept of moral hazard has been widely applied to banking (Dewatripont & Tirole, 1994). It posits that higher equity levels may embolden banks to take on more risk, casting doubt on the effectiveness of capital adequacy requirements like Basel III in risk mitigation. Jensen and Meckling's (1976) seminal work lays the foundation for understanding how managerial efficiency can affect a bank's risk profile. They claim that inefficiencies in management may lead to increased risk-taking to offset poor performance. Regarding the Efficiency–Structure Hypothesis, Demsetz (1973) argued that market structure impacts performance, suggesting that larger, more efficient banks might be better equipped to manage risks due to economies of scale and scope.

This study deliberates these previous studies under the following headings.

2.1. Impact of Bank Capital on Bank Risk

The regulatory hypothesis argues that as banks take additional risk, they hold more default risk. To counter this risk of bankruptcy, regulators push banks to increase their capital significantly, thus forming a positive relationship between capital and risk. Those favouring a negative relationship between capital and risk second the moral hazard hypothesis. A flat deposit insurance arrangement places more risk on banks and pays less attention to capital. Some academics debate that capital requirements do not impact banks' risk-taking behaviour, since banks keep "capital buffers" above the statutory capital ratio. They believe that capital requirements do not compel banks to take particular risks because they can choose their preferred capital ratios and risk-taking habits.

Rime (2001) studied the changes in risk and capital quantity of the banks in Switzerland from 1989 to 1995 by applying the modified simultaneous equation model (SEM). The study concludes that regulators' coercive power has an affirmative effect on banks' capital; however, it has an insignificant effect on their risk. Altunbas et al. (2007) favoured the positive relationship between bank capital and risk-taking, which aligns with the regulatory hypothesis. They examined the link between European banks' risk and efficiency levels from 1992 to 2000. Awdeh et al. (2011) investigated the relationship between capital regulations and risk-taking by studying the commercial banks of Lebanon over the period from 1996 to 2008. The study uncovers a positive relationship between bank capital and risk-taking in Lebanon. Basher et al. (2017) investigated the relationship between bank capital and risk among 22 Islamic banks and found a positive interaction between total capital and asset risks. Tan and Floros (2013) used a three-stage least square estimation to investigate the relationship between risk and capital in 101 Chinese commercial banks and discovered an inverse relationship between risk and bank capital, which is consistent with the moral hazard hypothesis. Ashraf et al. (2016) studied the effect of capital guidelines on risk using a sample of Pakistani commercial banks from 2005 to 2012. The study reveals an inverse relationship between capital requirements and risk-taking in Pakistan. Bashir and Hassan (2018) compared the capital regulations and risk relationship between Pakistani Islamic and conventional banks and found no difference in the effect of capital regulations on the risks of both types of banks. Margono et al. (2020) checked the mediation of capital adequacy on the bank performance of 30 banking companies in Indonesia from 2014 to 2019 and reported that credit risk mediates the capital adequacy effect. Hussein et al. (2022) observed that bank credit positively affected the economy's flourishing through its ability to finance projects.

2.2. Impact of Bank Capital on Bank Efficiency

The shareholder–debt holder hypothesis elaborates on the effect of capital on efficiency. Due to the different interests of shareholders and debt holders, debt financing will decrease, leading to high efficiency and an unfavourable effect on efficiency. This hypothesis cites the moral hazard behaviour of managers due to increased agency cost, reducing the cash at managers' disposal, ultimately reducing capital. Therefore, capital has an inverse relationship with efficiency. [Barth et al. \(2004\)](#) investigated how bank regulation and supervision affected bank efficiency in 107 countries but could not identify any substantial relationships between capital regulation and efficiency. In their opinion, private monitoring has a more significant role than government intervention. Similar observations were reported in the case of market discipline. [Delis et al. \(2011\)](#) investigated the impact of regulatory and supervisory structure on the effectiveness of 582 banks across a range of transition economies from 1999 to 2009 and concluded that overall Basel II capital restrictions and central bank supervision had little impact on the banks' efficiency. However, [Barth et al. \(2013\)](#) explored the effect of bank regulations on the operating efficiency of 4050 banks working in 72 countries from 1999 to 2007. Tight capital requirements were beneficial in increasing the banks' operational effectiveness. In their study, [Lee and Chih \(2013\)](#) looked at the profitability of 242 Chinese banks between 2004 and 2011 in connection to financial regulation. They discovered that the profitability of the banks was unaffected by capital regulation. They hold the opinion that tight rules do not increase bank efficiency. [Pessarossi and Weill \(2015\)](#) looked into how capital ratios affected Chinese banks' efficiency and discovered they had a favourable effect on cost-effectiveness. They observed an improvement in Chinese banks' cost-effectiveness after implementing capital requirements, indicating a favourable effect of capital ratio on cost efficiency. [Mongid \(2016\)](#) looked into the factors contributing to the inefficiency of ASEAN banks' cost structures. [Banna et al. \(2017\)](#) concluded that capital adequacy positively affected bank efficiency and reported their findings by observing the efficiency of Bangladeshi banks from 2000 to 2013. [Bashir \(2018\)](#) examined how capital regulation affected the effectiveness of the Pakistani banking sector and discovered a decline in bank efficiency.

2.3. Relationship of Bank Risk with Bank Efficiency

According to the skimping hypothesis coined by [Berger and DeYoung \(1997\)](#), in the short term, banks can afford to commit fewer funds to look after advances and non-performing loans stay similar. This hypothesis predicts a positive relationship between bank risk and bank efficiency. The bad management or bad luck hypothesis (another theory postulated by the same authors) portrays the inverse association between bank risk and efficiency.

The impact of risk and quality factors on Japanese commercial banks' cost efficiency between 1993 and 1996 was explored by [Altunbas et al., \(2000\)](#). They claimed that there is an inverse relationship between risk and efficiency. They believe that efficiency provides more flexibility to take risks. [Iannotta et al. \(2007\)](#) examined the impact of several micro- and macroeconomic factors on the performance of 15 major European banks between 1999 and 2004. They found that bank risk had a positive impact on bank performance. In their investigation of the effects of regulation on the efficiency of 14 commercial banks in Korea between 1995 and 2005, [Banker et al. \(2010\)](#) found that non-performing loans had a detrimental effect on bank production. Using various risk and efficiency proxies from 31 commercial banks in Columbia from 2002 to 2012, [Sarmiento and Galán \(2017\)](#) investigated the relationship between these same observed variables. The findings show that credit risk has a negative impact on cost efficiency and a positive impact on profit efficiency. They concluded that risk-taking behaviour is most prominent in big and international banks,

with bank size being the primary factor. In another study about the Lebanese banking sector regarding the relationship between a financial crisis, the COVID-19 pandemic, and the banks' performance, [Itani et al. \(2020\)](#) assert that many indicators are considered, including trust and conservative monetary and fiscal policy. [Hameed and Bouabid \(2023\)](#) assessed the operational efficiency of the National Bank of Iraq in their study. They believed that banks in their sample had a lower efficiency due to their reliance on safe-risk projects.

The abovementioned studies highlight that the literature on the relationship between bank risk and efficiency is extensive and multi-faceted, yet it leaves room for further exploration. In particular, there is a conspicuous gap in the literature concerning the impact of Basel III on the unique economic environments of Pakistan and India. Moreover, a paucity of longitudinal analyses spans across different Basel Accords, providing a temporal perspective on risk and efficiency. This study aims to fill these gaps by employing a longitudinal approach and focusing on the nuanced challenges and opportunities faced by banks in these countries.

Before moving to the hypothesis, it is vital to explain how Basel capital regulations, bank risk, and bank efficiency contribute to the improvement in bank performance. In times where the world is witnessing continuous financial turmoil, setting the goals of risk mitigation scales is very crucial. The industry's drive to enhance bank performance is justified by the increase in bank stability and having strong resilient components. We emphasize the urgent need for the industry to integrate capital regulations, bank risk, and bank efficiency.

2.4. Hypothesis

The hypotheses of this study have been formulated to address gaps and contradictions in the existing literature concerning the relationship between bank risk, efficiency, and regulatory capital requirements. Below is an in-depth examination of how each hypothesis is linked to the existing literature.

H1. *High Capital Adequacy Ratios Encourage Greater Risk-taking.*

Moral hazard theory posits that higher equity levels might embolden banks to engage in riskier activities ([Dewatripont & Tirole, 1994](#)). [Delis and Kouretas \(2011\)](#) also found that strict capital requirements might unintentionally encourage riskier lending practices. This hypothesis aims to empirically examine this theory in the context of Pakistani and Indian banks, particularly considering the capital buffers mandated by Basel III. While the literature supports this relationship, limited studies focus on how this dynamic occurs in emerging economies, specifically Pakistan and India. Moreover, the effectiveness of Basel III in curbing such moral hazard-driven risk-taking is under-researched.

H2. *Capital Regulations Negatively Impact Bank Efficiency.*

Studies by [Barth et al. \(2004\)](#) and [Maji and De \(2015\)](#) indicate that while the Basel Accords might successfully mitigate risk, they do not necessarily promote efficiency. This hypothesis aims to investigate this relationship in a contemporary setting under the Basel III framework. There is a dearth of studies examining the longitudinal impact of Basel III on bank efficiency, especially in the unique economic landscapes of Pakistan and India.

H3. *Efficient Banks are More Prone to Risk-taking.*

The Efficiency–Structure Hypothesis and some empirical studies like [Delis and Kouretas \(2011\)](#) suggest that efficient banks might engage in riskier but potentially higher-

rewarding activities. This hypothesis aims to scrutinise this relationship in the specified context. While studies have explored this relationship, they often do not account for the intervening effect of management efficiency, a gap this study aims to fill.

In summary, each hypothesis of this study is deeply rooted in existing academic discourse but aims to fill gaps or resolve contradictions within that discourse.

3. Methods and Materials

The research framework for this study involves analysing the relationship between Basel capital regulations, bank risk, and bank efficiency in the banking sectors of Pakistan and India. By analysing the relationships between these variables, the research framework aims to assess the impact of Basel capital regulations on bank risk and efficiency in Pakistan and India, collectively and individually. The framework allows for a comprehensive examination of the factors influencing banks' risk-taking behaviour and efficiency levels in the context of regulatory requirements and specific country dynamics. This study employs a quantitative approach and utilises the system-generalised method of moments (GMM) estimation technique to address potential endogeneity issues. [Baum \(2006\)](#) states that the correlation of the independent variable with the error term (endogeneity) produces spurious regression in the regression model. System-generalised method of moments estimation is employed to solve this issue. Previously, different researchers have employed this technique ([Lee & Hsieh, 2013](#)). There are some necessary rules to implement this technique, i.e., the number of units must not be less than or equal to the instruments used ([Roodman, 2009](#)). Hansen's test of over-identifying restrictions is used to check the legitimacy of instruments. Utilising the collapse option recommended by [Roodman \(2009\)](#) helps to solve the issue of having too many instruments. The instrumental variables of the for the models were selected by making sure of their relevancy and validity. This is achieved by reporting results of the Hansen test, etc.

The system-generalised method of moments (GMM) estimation technique was employed in this study because it has a major impact on empirical research in the finance field. Hence, it can be used in a straightforward way. Many financial studies used the GMM model, mainly in the asset-pricing area.

As per [Pugh \(2018\)](#), the benefits and advantages that this approach offer are various, including "more efficient estimation", the "ability to include time invariant regressors", and "stronger (more valid) instruments when the autoregressive parameter is very large".

To avoid biased results, the GMM is a flexible estimation method which can be used for systems of simultaneous equations. By considering interdependencies between the equations, the GMM can be used for more efficient and robust estimation. Moreover, the increase in the number of lags can significantly enhance the complexity of the model, making it more difficult to estimate and interpret. Moreover, estimating models with different lags lengths can be computationally expensive.

3.1. Data Sources and Sample

The data for this study were obtained from a sample of all commercial banks in Pakistan and India. To collect the necessary information, the researchers accessed the websites of the central banks of both countries. Additionally, the BankScope database was utilised to complement the data collection process. This study covers a period from 2009 to 2022, allowing for an analysis of the long-term relationship between Basel capital regulations, bank risk, and bank efficiency. This study aims to capture any potential changes or trends over time by including data from multiple years. Using comprehensive data from all commercial banks in Pakistan and India enhances the sample's representativeness and increases the findings' generalizability. By including data from the entire population of

commercial banks, this study provides a comprehensive overview of the banking sectors in both countries. The data collection process for this study ensures a robust and comprehensive sample, enabling a thorough analysis of the relationship between Basel capital regulations, bank risk, and bank efficiency in Pakistan and India.

3.2. Data Sources and Sample

The objective of this study is achieved by formulating the following equations:

$$\text{NPLGLit} = \alpha_0 + \beta_1 \text{NPLGLit-1} + \beta_2 \text{TCTRit} + \beta_3 \text{IITAit} + \beta_4 \text{SIZEit} + \beta_5 \text{ROAit} + \beta_6 \text{INF} + \beta_7 \text{GDP} + \epsilon_i \quad (1)$$

$$\text{IITAit} = \alpha_0 + \beta_1 \text{IITAit-1} + \beta_2 \text{TCTRit} + \beta_3 \text{NPLGLit} + \beta_4 \text{NIMit} + \beta_5 \text{SIZEit} + \beta_6 \text{ROAit} + \beta_7 \text{INF} + \beta_8 \text{GDP} + \epsilon_i \quad (2)$$

The empirical model used in this study consists of two equations that help analyse the relationship between various variables.

- Equation (1) focuses on the ratio of non-performing loans to gross loans (NPLGLit) as the dependent variable. It is modelled as a function of lagged NPLGLit-1, the capital adequacy ratio (TCTRit), the interest-income-to-total-assets ratio (IITAit), the bank's size (SIZEit), the return on assets (ROAit), inflation (INF), GDP growth (GDP), and the error term (ϵ_i).
- Equation (2) focuses on the interest-income-to-total-assets ratio (IITAit) as the dependent variable. It is modelled as a function of lagged IITAit-1, the capital adequacy ratio (TCTRit), the ratio of non-performing loans to gross loans (NPLGLit), the net interest margin (NIMit), the bank's size (SIZEit), the return on assets (ROAit), inflation (INF), GDP growth (GDP), and the error term (ϵ_i).

These equations allow the researchers to estimate the impact of different factors on non-performing loans, interest income, and bank efficiency. The model considers past values' effect on the current state by including lagged variables. The inclusion of control variables such as size, profitability, inflation, and GDP aims to capture the potential influence of these factors on the variables of interest.

Therefore, this model provides a framework for investigating the relationships between Basel capital regulations, risk indicators (such as non-performing loans), bank efficiency indicators (such as interest income), and other relevant control variables. By estimating the coefficients of the variables, the researchers can assess the significance and direction of these relationships.

3.3. Variables Specification

- **Total Capital (TCTR):** This variable captures bank capital regulation through the capital adequacy ratio (CAR), representing the relationship between a bank's capital and risk. It is measured by dividing a bank's total risk-weighted assets by the sum of its Tier 1 and Tier 2 capital.
- **Non-Performing Loans to Gross Loans (NPLGL):** This variable measures credit risk and represents the ratio of non-performing loans to gross loans. It provides insights into the quality of a bank's loan portfolio.
- **Interest Income to Total Assets (IITA):** This variable reflects bank efficiency and indicates the interest income generated by a bank relative to its total assets. Higher values of this ratio indicate efficiency.
- **Return on Assets (ROA):** This variable measures bank profitability by capturing the net income to average total assets ratio. It serves as an indicator of a bank's financial performance.
- **Control Variables:** This study includes additional control variables such as bank size, inflation, and GDP growth to account for potential confounding factors and macroeco-

nommic conditions that may influence the relationship between capital regulations, risk, and efficiency.

4. Results and Discussion

4.1. Descriptive Statistics

The distribution, central tendency, and dispersion of the variables for each bank in the sample are displayed in the upper portion of Table 1's descriptive statistics. According to Table 1, from 2009 to 2022, banks' NPL/gross loan ratios were, on average, 7.15%. The NPL/gross loan ratio ranges from 0% to 51.56%, with 51.56% being the highest value. Table 1 shows that banks had an average TCTR ratio of 15%. The maximum TCTR ratio for a bank is 57%, while the lowest TCTR a bank can hold is 08%. The average mean value of the ratio of interest income to total assets is 16%, and its minimum and maximum values fluctuate. The banks' net interest margin varies from -1.45% to 9.1% . In contrast, the banks' average interest margin ratio was 3%. The average return on asset (ROA) value is 0.72% , ranging from -7.08% to 3.06% at its highest and lowest points. After adjusting for the logarithm, the average value of the bank-specific variable size is 15.97, with maximum values of 21.64 and minimum values of 9.75. Like the control variables, GDP and inflation are reported with mean, minimum, and maximum values.

Table 1. Descriptive Statistics.

	Statistic	NPLGL%	TCTR%	IITA%	NIM%	ROA%	SIZE	GDP%	INF%
Whole Sample	Mean	7.15	14.58	6.17	3.06	0.72	15.97	6	8.58
	SD	7.61	6.15	3.26	1.38	1.12	2.95	2.22	3.22
	Min	0	0.08	-9.73	-1.45	-7.08	9.75	1.61	2.54
	Max	51.56	57.04	11.23	9.1	3.06	21.64	10.26	13.88
Pakistan	Mean	13.05	16.07	2.49	3.77	0.52	19.92	3.77	8.07
	SD	8.81	8.4	1.84	1.89	1.57	1.17	1.2	4.01
	Min	0	0.08	-9.73	-1.45	-7.08	16.14	1.61	2.54
	Max	51.56	57.04	7.23	9.1	3.06	21.64	5.47	13.88
India	Mean	3.31	13.65	8.563	2.62	0.85	13.82	7.44	8.49
	SD	2.82	3.91	0.95	0.61	0.66	1.29	1.37	2.59
	Min	0.2	8.67	2.83	0.82	-1.84	9.75	5.46	3.75
	Max	17.4	56.51	11.23	4.69	2.02	20.31	10.26	11.99

Source: Stata Output.

Table 1's middle and lower sections each separately display descriptive statistics for the banks of the two nations. In this case, the average NPL/gross loan ratio for Pakistani banks was higher than that of Indian banks (3.31% vs. 13.05%). The maximum value of this ratio was also higher than that of its Indian counterparts, indicating that Pakistani banks have a higher ratio of gross loans to non-performing loans. The average, minimum, and maximum values of the TCTR ratio between Indian and Pakistani banks are identical. Compared to Pakistani banks, Indian banks have a higher interest-income-to-total-asset ratio. The maximum and average values of Pakistani banks' net interest margin ratios are higher. The banks' returns on assets (ROA) in the two nations do not significantly differ. While Pakistan experienced high inflation at the time, India's GDP average and maximum value were higher. The average value of Pakistani banks' net interest margin ratio is higher, and the same can be said about the maximum value of this ratio. There is no substantial difference in the return on assets (ROA) of both countries' banks. India had a higher average and higher maximum GDP value, while inflation was high in Pakistan during this time.

4.2. Bank Risk Results

4.2.1. Factors Affecting Overall Bank Risk

Table 2 presents the result of different factors affecting the bank risk of Pakistani and Indian banks collectively. There is a significant and favourable impact of bank capital requirements on bank risk at 10%. Hence, overall, Basel capital regulations have raised bank risks in both nations. So hypothesis H1 is accepted, stating that a high capital adequacy ratio allows the banks to accept more risk, as they have more cushion in the form of a high capital ratio. Bank efficiency exerts a very significant favourable effect on bank risk. Inflation under 1% increases efficiency; bank risk increases by 10% when accepting H3. One reason for this positive impact is high efficiency, which allows banks to take additional risks. These results support the findings of (Delis & Kouretas, 2011). In terms of the effect on bank profitability, banks' profitability declines as they take on more risk, showing an inverse relationship. Table 2 also shows that big banks take more risk, since their size allows extra protection. The impact of the control variable inflation is positively significant at 1%. One argument can be that high inflation during this period might have increased the non-performing loans, thus increasing the risks of banks. The study (Fofack, 2005) shows the same findings.

Table 2. Impact of different factors on overall bank risk 2009–2022.

Variable	Coeff.	Stand Err
LNPLGL	0.631355 **	0.029231
TCTR	0.087357 *	0.051112
IITA	1.141144 **	0.306991
ROA	−4.16744 **	0.504169
SIZE	1.399717 **	0.257139
INF	0.014375 **	0.004262
GDP	−0.010341	0.010657
Chi Sq	5200.38 **	
Observations (No.)	394	
Banks (No.)	63	
Instruments (No.)	14	
Hansen test	0.201	
AR (2)	0.212	

**, * Significant at the 1%, and 10% levels. Source: Stata output.

The findings regarding factors affecting overall bank risk have important policy implications for the banking sector in Pakistan and India:

- **Capital Adequacy Ratio:** The significant and favourable impact of bank capital requirements on bank risk highlights the importance of maintaining a sufficient capital buffer. Policymakers should continue emphasising and enforcing adequate capitalisation standards to ensure banks have the necessary cushion to absorb potential losses. This can contribute to a more resilient banking system and reduce the likelihood of financial instability.
- **Bank Efficiency:** The strong positive effect of bank efficiency on bank risk suggests that efficient banks have a greater capacity to take on additional risk. Policymakers should encourage banks to adopt efficient operational practices and enhance their risk management capabilities. Promoting efficiency can help banks balance risk-taking

and maintain a sound financial position, ultimately contributing to a more stable and efficient banking sector.

- **Bank Size:** The finding that larger banks tend to take on more risk due to the protection provided by their size has policy implications for bank supervision and regulation. Regulators should closely monitor the risk-taking behaviour of larger banks and ensure they have robust risk management frameworks in place. Measures to promote competition and mitigate the concentration of risks associated with larger banks can enhance the overall stability of the banking sector.
- **Inflation Management:** The positive significant impact of inflation on bank risk suggests that high inflation levels may increase the risks faced by banks, potentially leading to higher non-performing loans. Policymakers should focus on implementing effective monetary policies to manage inflation and maintain price stability. Controlling inflation can reduce the adverse effects on bank risk and contribute to a more stable banking environment.
- **Bank Profitability:** The inverse relationship between bank profitability and risk underscores the importance of maintaining a sustainable level of profitability while managing risk effectively. Policymakers should promote a prudent approach to risk-taking and ensure that banks' pursuit of higher profitability does not compromise their financial stability. Striking a balance between profitability and risk management is crucial for banks' long-term viability and the banking sector's stability.

4.2.2. Factors Affecting Individual Country Bank Risk

This study's samples are divided into subsamples to measure the impact of various variables on the risk taken by banks in Pakistan and India separately. Table 3 displays the effects of various factors on the individual risks taken by banks in Pakistan and India. Table 3 also displays that the Basel Accords' capital requirements have increased the banks' risks of accepting H1 in both countries. The average TCTR ratio in India and Pakistan is 13.65% and 16.07%, respectively, above the regulatory requirement of 8% (Basel II) and 10.5% (Basel III). This capital buffer (actual minus required capital) allows them a cushion to indulge in highly risky activities. Both in Pakistan and India, efficiency has a significant positive impact on bank risk, accepting H3. As banks become efficient, they can afford to take extra risk under a low possibility of default due to this high efficiency. Size does increase bank risk-taking in both countries, as it allows banks to decrease the negative effects of high risk. The effect of profitability in both countries is negative. As banks take more risk, their profitability decreases.

The findings regarding factors affecting individual country bank risk in Pakistan and India provide valuable insights into the dynamics of risk-taking behaviour in these banking systems. The results show that the capital requirements imposed by the Basel Accords have contributed to increased bank risk in both countries. This suggests that banks, on average, have capital ratios exceeding regulatory thresholds, providing them with a cushion to engage in riskier activities. Regulators need to monitor banks' risk profiles closely and ensure that capital requirements strike an appropriate balance between stability and incentivising excessive risk-taking.

Efficiency emerges as a significant factor positively impacting bank risk in both Pakistan and India. This implies that more efficient banks are willing to take on additional risk, potentially due to their ability to manage and mitigate risks effectively. However, regulators must ensure that risk management frameworks keep pace with efficiency gains to avoid potential systemic risks arising from overly aggressive risk-taking.

Table 3. Impact of different factors on individual bank risk 2009–2022.

Variable	Pakistan		India	
	Coefficient	Stand Err	Coefficient	Stand Err
LNPLGL	0.818737 ***	0.034987	0.161279	0.137234
TCTR	0.261585 ***	0.063124	0.765984 ***	0.192884
IITA	3.928438 ***	1.292468	0.79145 **	0.493632
ROA	−9.35921 ***	2.045294	5.946023 ***	1.194321
SIZE	4.340747 ***	1.022955	0.999632 ***	0.321565
INF	0.019182	0.023380	−0.013727 **	0.005770
GDP	−0.020849	0.064737	0.004609	0.015542
Chi Sq	2187.87 ***		162.78 ***	
Observations (No)	152		242	
Banks (No)	24		39	
Instruments (No)	17		11	
Hansen Test	0.183		0.317	
AR (2)	0.278		0.117	

***, ** Significant at the 1% and 5% levels.

This study also reveals that bank size positively affects risk-taking behaviour in both countries. Larger banks may be better equipped to absorb the negative consequences of high-risk activities due to their greater resources and diversification. Regulators need to pay close attention to the risk concentration within larger banks and implement appropriate measures to mitigate potential systemic risks associated with their size. Furthermore, the negative relationship between risk-taking and profitability indicates that as banks take on more risk, their profitability tends to decline. This highlights the importance of maintaining a prudent balance between risk and reward to ensure the long-term sustainability of banks' profitability and overall financial stability.

4.2.3. Factors Affecting Bank Risk in the Basel III Period

The effect of bank capital on bank risk during the Basel III era is examined in Table 4. This study shows that although there is a positive relationship between bank capital and bank risk, it is not statistically significant. Basel III capital regulations, therefore, do not affect bank risk-taking in either country, rejecting H1. This outcome is unexpected because Basel capital regulations were put in place to stop banks from taking on excessive risk, but in this instance, they were not up to the mark. This finding demonstrates that banks possessing capital ratios higher than the minimum required are insensitive to these requirements and possess their own capital and risk management policies (Maji & De, 2015). As the average TCTR of banks in both countries under Basel III is 46.46%, way above the 10.5% suggested by Basel III, these capital regulations did not exert any influence concerning the risk taken by the banks. Moreover, the implementation of Basel III in both countries started in 2013, and Basel III capital regulations may require a longer period to show their effect on the risks of banks. Regarding the impact of efficiency on banks' risk-taking behaviour in Basel III, this study accepts H3.

The results shown in Tables 2–4 show that, on the whole, Basel capital requirements have increased the risks taken by banks in both countries. However, under Basel III from 2013 to 2022, capital regulations did not impact bank risk-taking.

Table 4. Effect of various factors on bank risk-taking under Basel III 2013–2022.

Variable	Coeff	Stand Err
LNPLGL	0.682511 *	0.041574
TCTR	0.042252	0.066948
IITA	1.215297 *	0.331459
SIZE	1.396824 *	0.333079
ROA	−3.601432 *	0.5962198
INF	0.024553 *	0.005447
GDP	−0.087813 *	0.022459
Chi Sq	1001.50 *	
Observations (No)	172	
Banks (No)	60	
Instruments (No)	17	
Hansen test	0.212	
AR (2)	0.886	

* Significant at the 1% levels. Source: Stata output.

4.3. Bank Efficiency Results

4.3.1. Factors Affecting Overall Bank Efficiency

Factors affecting the collective banks' efficiency in both countries are reported in Table 5. Implementing capital regulations has decreased the efficiency of banks in both countries because capital requirements significantly negatively impact their performance. The results of this study reject H2 because the banks maintain a high level of capital to reduce the default risk, thus leading to less monitoring of loans, which reduces bank efficiency. [Mongid \(2016\)](#) reports the same results. Bank risk also has an inverse impact on bank efficiency in both countries. The results of this study reject the H3 hypothesis that banks' efficiency will be reduced due to inefficiency of management. The effect of management inefficiency will be compensated by inefficient banks taking more risks. Another reason could be inefficient management or some external events beyond management's control, and efficiency will be reduced, resulting in an inverse relationship between efficiency and risk. These findings align with those of [Altunbas et al. \(2000\)](#). The results of this table also show that bank profitability negatively impacts efficiency. The other control variable, GDP, is negative and significant at 10%.

The results on factors affecting overall bank efficiency provide valuable insights into the relationship between various factors and banks' performance in terms of efficiency. This study finds that implementing capital regulations has led to a decrease in bank efficiency in both countries. This suggests that the stringent capital requirements imposed on banks have negatively impacted their performance. The findings align with previous research by [Mongid \(2016\)](#), indicating a consistent pattern across different studies.

Bank risk is another factor that inversely affects bank efficiency in both countries. The study's results reject the hypothesis that banks' inefficiency would reduce efficiency due to increased risk-taking. Instead, it suggests that inefficient banks may compensate for their inefficiency by taking on more risk. This finding is consistent with the findings of [Altunbas et al. \(2000\)](#), further supporting the notion of an inverse relationship between efficiency and risk. Furthermore, this study reveals a negative impact of bank profitability on efficiency. It implies that as profitability decreases, bank efficiency tends to decline. This finding highlights the importance of balancing profitability and efficiency to ensure sustainable

performance. The control variable, GDP, is found to have a negative and significant impact on efficiency at 10%. This suggests that economic factors, as reflected by GDP, can influence banks' overall efficiency. Policymakers and regulators must consider the broader economic context when evaluating and promoting bank efficiency.

Table 5. Impact of different factors on overall bank efficiency 2009–2022.

Variable	Coeff	Stand Err
L IITA	0.912704 ***	0.169890
TCTR	−0.041331 ***	0.014875
NPLGL	−0.063811 **	0.029331
NIM	0.313341	0.270941
SIZE	0.020796	0.234962
ROA	−0.580321 *	0.334531
INF	0.000525	0.002958
GDP	−0.018535 ***	0.007124
Chi Sq	6078.08 ***	
Observations (No)	394	
Banks (No)	63	
Instruments (No)	13	
Hansen test	0.394	
AR (2)	0.696	

***, **, * Significant at the 1%, 5%, and 10% levels. Source: Stata output.

4.3.2. Factors Affecting Individual Country Bank Efficiency

The impact of various factors on bank efficiency in Pakistani and Indian banks is quantified in Table 6. Capital restrictions do not impact banking efficiency in Pakistan, but they reduce it in Indian banks, rejecting H2 in both nations. Table 6 shows a difference in how capital regulations affect bank efficiency in the two countries. This difference in how capital regulations affect bank efficiency can be attributed to the different average values of bank efficiency. In Pakistani banks, the average value of bank efficiency is 2.49%, while their Indian counterparts have 8.563% as the average bank efficiency value during the same time. Since the average efficiency of Indian banks is much higher than that of Pakistani banks, Indian banks face low bankruptcy risk. This low default risk in Indian banks might allow them to have lower capital ratios due to the high efficiency value. Bank risk has an inverse relationship, rejecting H3 in both Pakistan and India, in line with the results of Table 5. Similarly, other results are also stated in the table below.

According to the findings in Tables 5 and 6, the Basel capital regulations have not, in general, improved the efficiency of banks in either country. Bank efficiency has dropped in both countries' banks. The impact of capital regulations on the effectiveness of banks in different nations is mixed, as it lowers the effectiveness of Indian banks while not affecting their Pakistani counterparts. There must be a different mechanism or set of policies to increase the banking industry's efficiency because the Basel Accord's capital regulations are ineffective. This study's findings show that Basel capital requirements positively affect overall risk but negatively affect both countries' overall efficiency.

Additionally, Pakistani and Indian banks' capital requirements have an affirmative impact on their respective banks' risks. Individual Basel capital regulations have no

negative impact on the effectiveness of Indian and Pakistani banking. The bank risk in both nations is unaffected by Basel III capital regulations.

Table 6. Effect of different factors on individual country bank efficiency 2009–2022.

Variable	Pakistan		India	
	Coefficient	Stand Err	Coefficient	Stand Err
LIITA	0.149018 ***	0.023920	1.019408 ***	0.0672848
TCTR	0.006042	0.013263	−0.07064 ***	0.0235564
NPLGL	−0.026071 **	0.012483	−0.101234 **	0.0438084
NIM	−0.159184	0.134154	−0.966537 *	0.5328721
SIZE	−0.59330 ***	0.143407	0.1203391	0.1249695
ROA	1.246127 ***	0.073858	0.5817579	0.444637
INF	0.006430 ***	0.001508	−0.010907 ***	0.0020621
GDP	0.007245	0.005652	−0.056634 ***	0.0060468
Chi Sq	1770.90 ***		298.49 ***	
Observations (No)	152		242	
Banks (No)	24		39	
Instruments (No)	22		13	
Hansen test (<i>p</i> -value)	0.101		0.271	
AR (2)	0.309		0.787	

***, **, * Significant at the 1%, 5%, and 10% levels. Source: Stata output.

In the Results Section, the author placed emphasis on the interpretation of independent variables (IVs). The variables ROA, INF, and GDP are control variables. Though both countries have some similarities, they are not alike in terms of the composition and restructuring of the financial sector, etc. So, these control variables can have a different effect on the banks of the individual countries.

5. Conclusions

This study examines the relationship between Pakistani and Indian commercial banks' Basel capital requirements, risk, and efficiency from 2009 to 2022. This study also separately analyses the Basel III capital regulations' impact on risk. The findings show that Basel capital regulations have generally increased bank risk-taking by positively affecting the risks of banks in both countries. Basel capital regulations have had a detrimental effect on both countries' overall efficiency. These findings demonstrate that the 2009–2022 period saw a decline in bank efficiency in both Pakistan and India, demonstrating the ineffectiveness of Basel capital regulations in raising efficiency levels. The relationship between capital regulations, risk, and efficiency varies by country.

These capital regulations favourably impact risks and do not affect the Pakistani bank's efficiency. In the case of Indian banks, these regulations increase risk and decrease efficiency. The results of this study also highlight the inability of Basel III capital regulations to affect the risk taken by the banks. The findings of this study will assist both countries' central banks in assessing capital regulations' relation with risk and efficiency, respectively. They will also help the regulators of the central banks implement suitable mechanisms for the banking industry.

Moreover, several other key implications and considerations arise from this study's findings regarding the relationship between Basel capital requirements, risk, and efficiency in Pakistani and Indian commercial banks. The following points expand on the conclusions and provide further insights into the implications of this study's results:

- **Need for Customised Regulatory Approaches:** This study highlights the importance of tailoring regulatory approaches to the specific characteristics and circumstances of each country's banking sector. While Basel capital regulations have generally increased bank risk-taking in both countries, the impact on efficiency differs. This underscores the need for regulators to consider the unique dynamics and challenges banks face in each jurisdiction when formulating regulatory frameworks. A one-size-fits-all approach may not effectively address different banking systems' diverse needs and realities.
- **Balancing Risk Management and Efficiency:** The findings suggest a delicate balance between risk management and efficiency in the banking industry. Basel capital regulations aim to enhance the stability and resilience of banks by imposing capital requirements to mitigate risk. However, this study reveals that higher capital requirements may inadvertently lead to reduced efficiency, particularly in the case of Indian banks. When formulating and implementing capital regulations, policymakers and regulators must consider the trade-off between risk reduction and efficiency optimisation.
- **Role of Management Efficiency:** This study highlights the role of management efficiency in influencing the relationship between capital regulations, risk, and efficiency. Inefficient banks may compensate for their inefficiency by taking on more risk, negating the intended risk-reducing effects of capital requirements. This underscores the importance of effective management practices and governance structures in ensuring banks operate prudently and efficiently. Regulators should focus on capital adequacy and promoting sound management practices to enhance overall banking efficiency.
- **Impact of Macroeconomic Factors:** This study reveals the influence of macroeconomic factors, such as GDP and inflation, on bank risk and efficiency. Higher inflation levels during the study period were associated with increased non-performing loans and higher bank risks. This highlights the interconnectedness between the macroeconomic environment and the banking sector. When formulating regulatory policies, regulators and central banks should closely monitor macroeconomic conditions and consider their impact on bank stability and performance.
- **Long-term Implications for Policy Development:** The findings of this study provide valuable insights for policymakers and regulators in assessing the effectiveness of Basel capital regulations and designing future policy measures. Over the study period, the observed decline in bank efficiency indicates the need for continuous evaluation and refinement of regulatory frameworks to achieve enhanced risk management outcomes and improved efficiency. Policymakers should engage in ongoing dialogue with industry stakeholders and conduct periodic assessments to adapt regulatory measures in response to evolving market dynamics.

In conclusion, this study's findings broadly affect Pakistan and India's regulatory authorities, central banks, and policymakers. This study emphasises the need for a nuanced approach to capital regulations, considering each banking system's specific characteristics. It underscores the importance of balancing risk reduction and efficiency optimisation and highlights the role of effective management practices. Furthermore, this study underscores the significance of monitoring macroeconomic factors and their impact on bank risk and efficiency. By considering these implications, regulators and policymakers can work towards developing robust and adaptive regulatory frameworks that foster a stable, resilient, and efficient banking sector.

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