Financial Sustainability Beyond Bank Fundamentals in India: Evidence from Internal Vulnerabilities and External Risks

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Abstract

There is growing emphasis on evaluating banks' capacity to sustain returns by examining risks beyond balance sheets. Therefore, the study investigates how internal vulnerabilities and external financial risks influence the financial sustainability of Indian banks during 2015- 2024. The findings indicate that financial sustainability is persistent and net non performing assets significantly reduce financial sustainability measured through return on equity, while gross non performing assets remain insignificant. This indicates that the net impact of impaired assets is more crucial for sustaining banks' returns than overall gross asset deterioration. External financial risks offer valuable insights, monetary policy uncertainty weakens financial sustainability, whereas the international financial stress indicator significantly but positively influences it. International financial stress does not enhance the sustainability directly. Instead, banks face challenges, although regulation and earnings help to mitigate these effects. Among macroeconomic conditions, GDP has an insignificant impact, while inflation significantly influences financial sustainability. The findings emphasise recovery and resolution of stressed assets, integrating uncertainty into financial planning and risk evaluation, monitoring international financial conditions and maintaining prudential safeguards on banks' international activities. Overall, assessing the financial sustainability of Indian banks requires attention to global and domestic financial conditions bank level fundamentals and external risk developments continually.

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JEL Classification – G21, Z23, C33, D80

Introduction

In an increasingly interconnected and volatile financial environment, the resilience of the banking system has become an important concern for policymakers, regulators and financial institutions worldwide (Lu et al., 2024; Li et al., 2025). As financial intermediaries, banks

facilitate efficient resource allocation, support investment activities and promote economic growth (Bernard, 2022). Given this central role, the ability of banks to generate and sustain financial returns is important for maintaining their capacity to perform these economic functions over time. Thus, sustainability extends beyond merely achieving profits, although profitability and sustainability are related but are not identical. Profitability is generating income, whereas financial sustainability focuses on maintaining financial capability and creating economic value over time (Li & Faff, 2019; Henock, 2019; Zabolotnyy & Wasilewski, 2019; Wu et al., 2023). For banks, it is closely related to maintaining their ability to generate returns from the equity capital supporting their activities. Return on equity (ROE) is particularly important because it directly relates the earnings generated by a bank to the equity committed to its operations, thereby capturing the financial return obtained from the institutional capital base. In line with previous studies (Kong et al., 2023; Wu et al., 2023; Meher & Getaneh, 2019; Zahid & Ramij, 2025; Quraishi et al., 2026), ROE provides a meaningful accounting based indicator of financial sustainability.

The importance of financial sustainability has gained renewed attention following successive incidents of financial turbulence, such as the global financial crisis, COVID 19 pandemic, geopolitical stress and stricter monetary conditions across major economies (Phan et al., 2022; Goswami & Malik, 2025). These incidents highlighted the banking sector's vulnerability to internal and external shocks (Kantharia & Biradar, 2022). The Indian banking sector has experienced significant changes due to regulatory reforms, recapitalization initiatives, consolidation and digital financial services (Liang et., 2025). However, banks continue to face enduring internal challenges, particularly the asset quality deterioration, which threatens its stability (Alqahtami et al., 2022).

Theoretically, banks' capacity to sustain financial returns depends on both the quality of their intermediation activities and the external conditions under which they operate. Financial intermediation theory (Diamond, 1984) emphasises the importance of borrowers monitoring, providing a foundation for understanding how deterioration in asset quality, reflected in gross and net NPAs, may constrain banks' earnings through impaired loan recovery and provision requirements. Poor asset quality reduces profitability, constrains lending capacity and increases financial risk, consequently weakening the financial sustainability of banks (Swami et al., 2022; Gupta & Sharma, 2022). Therefore, NPAs management has remained a key policy concern (Gaur & Mohapatra, 2020). However, bank level credit risks operate within a broader macro financial environment consequently, banks' earnings cannot be understood solely through

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internal balance sheet conditions or external macroeconomic development in isolation. However, existing studies examined credit risk, macroeconomic variables and external risks independently, without considering their integrated effect on banks' financial sustainability.

Moreover, the examination of global indicators remains limited in the context of Indian banks, which as primarily focus on risk taking, lending activities and market based outcomes. This limitation is significant given the increasingly interconnected financial environment in which Indian banks operate. Therefore, the literature lacks a comprehensive understanding of how internal vulnerabilities and external risks impact the financial sustainability of Indian banks. This study incorporates the news based financial stress indicator and monetary policy uncertainty, which quantify market stress and policy related uncertainty though a systematic analysis of newspaper coverage (Puttman, 2018; Husted et al., 2020). Unlike conventional bank specific risks, these measures indicate broader external forces that may affect banks' funding conditions, risk perceptions, lending decisions and earning capabilities.

This study seeks to bridge existing gaps in understanding the financial sustainability of banks by examining the influence of both internal and external financial risks. It specifically explores how the decline in asset quality measured through NNPAs and GNPAs, affect financial sustainability. Additionally, the study assesses the impact of external risks such as MPU and FSI and considers the effect of domestic macroeconomic conditions including GDP and inflation. The findings are crucial for developing effective regulatory policies, risk management and ensuring long term financial sustainability. furthermore, the study provides valuable insights for other emerging economies facing similar challenges related to financial stability and economic uncertainties.

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Literature Review

Theoretical Framework

Financial sustainability in banking depends on the ability of banks to generate returns while managing internal credit exposures and responding to changing external conditions. Financial intermediation theory provides the theoretical foundation for the study, as Diamond (1984) stated that banks address information asymmetries through borrower screening and delegated monitoring. Although effective intermediation supports banks' return generating capacity, deteriorating asset quality can weaken returns through credit losses and provisioning requirements. Furthermore, banks operate within a border financial environment in which uncertainty may complicate lending and funding decisions. Financial stress may amplify financing constraints and transmit shocks across financial markets (Bernanke et al., 1999; Baker

et al., 2016). The macroeconomic conditions further shape these relationships by influencing credit demand, borrowers' repayment capacity and banks' income and costs. The following literature develops the hypotheses by considering the relevant theoretical framework and empirical evidence for the influence of internal and external risks on the financial sustainability of Indian banks.

Financial Sustainability Measurement

Financial sustainability is increasingly viewed as the ability to maintain financial health and sustain returns over the long term (Gyimah & Afriyie, 2025), rather than simply focusing on profitability in the banking sector. Gleibner (2022) defines financial sustainability by considering factors such as growth, survival, exposure to earning risks and risk return characteristics, highlighting that sustainability involves more than just short term profits. This broader perspective adopts different operationalisations. For example, Shi et al. (2025) describe financial sustainability as multi stage process that includes deposit mobilisation, lending and profitability, while Wan et al. (2026) focus on profitability and technical efficiency in Chinese rural banks. Other recent studies also explore complementary financial dimensions. Amoa et al. (2025) assessed it through the net interest margin and cost efficiency ratio. Alongside these multidimensional approaches, some banking studies examine the financial dimension of sustainability through accounting return measures. Notably, Quartey et al. (2019) and Zahid and Ramji (2025) explicitly use ROE and ROA as financial sustainability outcomes.

Similarly, Najam et al. (2022) used ROA in ASEAN banks. Moreover, Tariq et al. (2026) combined sustainable development growth with ROA to measure the financial sustainability of banks in China. Other studies, such as Kong et al. (2023), Wu et al. (2023) and Quraishi et al. (2026), used ROE to measure financial sustainability. These different measurements are not necessarily competing definitions but reflect different analytical focuses within the broader sustainability concept. Consistent with a dimension specific perspective, the current study uses ROE to measure the financial return dimension of banks' financial sustainability. This emphasis is thus on the ongoing ability of banks to generate returns on their equity base and how this ability adapts to internal and external risks, including macroeconomic conditions.

Internal Risk and Financial Sustainability

Banking is inherently a risk bearing activity because financial intermediation requires banks to transform relatively liquid liabilities into longer assets whose repayment is uncertain. Risk is therefore not external to the banking sector, rather, it is embedded in the process through which banks generate returns from financial intermediation. Among the different forms of banking

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risk, credit risk is particularly central because loans constitute a major component of banks' earning assets and their returns depend fundamentally on borrowers' ability to meet contractual obligations (Addou et al., 2024; Saeed & Donkoh, 2026; Mapfumo & Shongwe, 2026). Financial intermediation theory (Diamond,1984; Allen & Santomero, 1997) explains this relationship through banks' role as delegated monitors, such as borrowers screening, monitoring and managing credit exposures precisely because information asymmetries make direct lending costly. The deterioration in loan quality represents a weakening of an essential function of intermediation and can affect the banks' sustainable performance. Within this context, GNPAs and NNPAs are related but conceptually distinct measures of credit quality deterioration. GNPAs capture the gross amount of loans that have become non performing relative to banks' gross advances, while NNPAs provide information about the portion of that exposure that remains after recognised loss coverage (RBI, 2021; Rosario & Mavuri, 2026).

This study is driven by the need to clarify the distinction between gross impaired assets and residual exposure, which is crucial for understanding a bank's financial health. While existing studies generally supports the adverse credit risk mechanism, it has not determined whether gross and residual credit exposures have equivalent implications for financial sustainability. Consequently, the distinctions have motivated the researchers to investigate the impact of GNPAs and NNPAs on the financial sustainability of Indian banks.

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Gross Non Performing Assets (GNPAs) and Financial Sustainability

The theoretical arguments are further supported by empirical evidence linking asset quality deterioration to banks' performance. The recent evidence consistently indicates that higher GNPAs are associated with weaker bank performance. Aggrawal and Kumar (2026) report a negative relationship between GNPAs and profitability, measured by ROA, suggesting that deterioration in loan quality constrains banks' ability to generate returns from their asset base. Consistent with Yadav and Asthana (2025), Prasad et al. (2026), Begum and Khandelwal (2026) and Tamilselvi and Sahoo (2026) documented negative effects of GNPAs on profitability indicators, including ROA and Net Interest Margin, particularly in Indian banks. Consequently, the findings reinforce the argument that deterioration in credit quality reduces the income generating capacity of banks. Importantly, this relationship is not certainly unidirectional. Mishra and Pradhan (2026) showed that less efficient banks tend to experience a higher level of bad loans, highlighting a possible reverse channel in which weak managerial and operational efficiency contributes to subsequent deterioration in asset quality. Overall, the empirical evidences usually showed the negative association between GNPAs and profitability of banks,

reflecting the adverse consequences of deteriorating asset quality. However, the existing literature has largely examined profitability indicators, particularly ROA and Net interest Margin, with comparatively limited evidence on earning based sustainability as measured through ROE. Additionally, the existing literature is drawn from different banking contexts and samples, including geographically specific settings, which suggests scope for further evidence using a broader sample of Indian banks. Accordingly, the study expects higher GNPAs to be associated with weaker financial sustainability of Indian banks.

H1: GNPAs significantly negatively influence financial sustainability.

Net Non Performing Assets (NNPAs) and Financial Sustainability

NNPAs indicate the residual burden on non performing loans after accounting for provisions and therefore provide a more direct indication of the credit losses that remain exposed on banks' balance sheets (Rosario & Mayuri, 2026). From the accounting perspective, higher NNPAs stated that provisions have not fully absorbed the losses of impaired assets, potentially constraining future earnings and shareholders' returns.

Empirical studies broadly report an adverse relationship between NNPAs and banks' performance. In India, Bhatia and Kumar (2025) and Lohan et al. (2026) reported that higher NNPA is associated with lower ROE and ROA of banks, whereas Dey and Shome (2026) also extended this relationship to the market value of banks. Evidence from other emerging countries similarly reports adverse effects on the bank's performance (Das & Uppal, 2021; Hunjra et al., 2022; Rosario & Mavuri, 2026; Saeed & Donkoh, 2026). In addition, recent studies further extend this negative relationship to financial sustainability outcomes in Ghana and South Africa (Amoa et al., 2025; Nhleko & Adelowotan, 2025). Most studies consider NNPAs as part of the broader credit risk framework, while relatively limited attention is given to their relationship with earning based sustainability alongside GNPAs. Since, GNPAs captures the gross level of NPAs and NNPAs reflects the level after provisioning, both measures can provide a more complete assessment of how asset quality risk influenced banks' financial sustainability of Indian banks. Accordingly, based on the theoretical and empirical evidence, the researcher proposed the following hypothesis;

H2: NNPAs significantly negatively influence financial sustainability.

External Risk and Financial Sustainability

Banks' financial sustainability depends not only on their internal financial strength but also on their ability to maintain stable earnings amid changing external financial conditions.

Monetary Policy Uncertainty (MPU) and Financial Sustainability

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MPU is an external risk because it makes future monetary and financial conditions harder to anticipate. From a Knightian perspective, uncertainty arises when future outcomes and their probabilities cannot be reliably assessed (Knight, 1921). As uncertainty rises, the option value of waiting also becomes important, so banks may delay or moderate decisions until more information becomes available, affecting lending, portfolio allocation and risk taking decisions (Bernanke, 1983). The existing literature on economic policy uncertainty shows uncertainty transmission (Baker et al., 2016). It also increases information asymmetry and financing costs, potentially limiting firms' funding through reduced lending or stricter conditions and amplifying constraints (Bordo et al., 2016; Danisman et al., 2020; Hamdi & Hassen, 2022; Ozili & Arun, 2023; Huynh, 2024). Similarly, Dang and Nguyen (2023) discovered that uncertainty decreases return in banks. However, Economic policy uncertainty involves uncertainty from multiple policy domains, making it challenging to pinpoint the specific mechanism through which monetary conditions influence banks' sustainability.

This limitation offers a rationale for shifting focus from general to specific policy uncertainty in monetary policy. MPU refers to the unpredictability of monetary policy actions, including rate fluctuations, liquidity management and banks' communication strategies (Husted et al., 2020; Hu et al., 2023; Ha & Dang, 2026). According to Ge et al. (2023), MPU affects both banks' profitability and risk exposure because higher MPU increases NPLs while reducing lending, weakening intermediation and elevating credit risk in China (Jiang et al., 2022). Consistent with Xiang & Li (2022), Li et al. (2025) also concluded that it increases debt financing costs and reduces investment. A study from India also showed that MPU can affect monetary policy transmission to financial markets (Sen et al., 2026), influencing loan pricing, liquidity management and interest income. However, existing literature mainly addresses credit risk, risk taking behaviour and monetary transmission, with limited attention to whether MPU affects banks' ability to sustain returns. Therefore, the study examines MPU as an external risk affecting banks' financial sustainability measured through ROE.

H3: MPU significantly negatively influences financial sustainability

Financial Stress Indicator (FSI) and Financial Sustainability

Financial stress is a significant external constraint on banking activity because financial market disturbances can alter how financial institutions obtain funds, price risk and extend credit (Yousfani et al., 2025). Existing studies have identified financial stress as a key driver of instability however, few studies have focused only on domestic perspectives, limiting the financial system to national borders (Wang & Su, 2024; Novak et al., 2025; Yadav, 2025). As

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financial integration progresses, the limitations of this perspective become more pronounced, as domestic financial conditions increasingly respond to shock from major external financial markets (Bhardwaj et al., 2026). The interconnectedness of financial system enables the transmission of stress across borders.

This is relevant for banks because their financial positions depend on the broader financial environment. The financial accelerator theory reports that credit market imperfections create a wedge between the cost of external finance and internal funds (Bernanke et al., 1999).

An initial financial shock can be augmented through changes in financing conditions and credit availability. International empirical evidence supports this mechanism. Fink and Schuler (2015) and Baruah et al. (2026) showed that U.S. financial shocks act globally, transmitting through interconnectedness to increase volatility and reduce economic performance in emerging nations. Likewise, Park and Mercado (2014) and Long et al. (2024) showed that financial stress is highly connected across economies, strengthening after the global financial crisis and the COVID 19 pandemic. Thus, external financial stress is an important driver of domestic conditions. Other researchers have shown the adverse influence of global financial stress on banks' financial performance (Banu et al., 2024; Hajian & Yazdanbakhsh, 2026), while Shim and Shin (2021) suggested that increased financial stress in lender countries reduces bank lending to emerging market economies.

Furthermore, Engler et.al. (2023) suggested that U.S. economic and monetary developments have significant spillover effects on emerging market conditions, although the effect differs across countries. These variations appear in India, where Ghosh et al. (2025) identified a positive effect of financial stress and GDP during the Euro crisis and Covid 19 shock, whereas Goswami (2022) found that Indian banks experienced a moderate decline in efficiency during the global crisis. Consequently, the existing studies mainly focus on credit, capital flows, systemic risk and macroeconomic outcomes, while the direct effect of U.S. financial stress on the financial sustainability of Indian banks remains insufficiently explored. Nevertheless, the mainly evidences of adverse effects offer a basis for expecting U.S. financial stress to weaken the financial sustainability of Indian banks. Therefore, the following hypothesis is proposed:

H4: FSI significantly negatively influences financial sustainability.

Macroeconomic Conditions and Financial Sustainability

The macroeconomic conditions provide the broader environment within which banks undertake financial intermediation and generate returns.

Gross Domestic Product (GDP) and Financial Sustainability

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GDP growth may strengthen banks' financial sustainability by influencing their income generating capacity and the quality of their loan portfolios. This can be supported by the Demand Following Hypothesis proposed by Robinson (1952) and Patrick (1966): economic growth stimulates demand for financial services. As economic activity expands, demand for credit and banking services may increase, while improved economic conditions can strengthen borrowers' repayment capacity. Empirical evidence is also consistent with the theoretical argument and concludes the positive association between GDP and banks' profitability in the EU, MENA, MINT ASEAN and the UAE (Tabash, 2019; Abdelmoneim & Yasser, 2023; Karadzic & Dalovic, 2021), suggesting that a stronger economy enhances lending opportunities and borrowers' repayment capacity. Conversely, Myra and Leon (2020) confirmed that economic expansion does not necessarily translate into higher bank profitability. These inconsistent findings suggest that Economic growth influence may depend on country specific conditions. However, GDP growth is an individual determinant of profitability, providing comparatively limited insight into its role alongside banking internal and external risks. Addressing these limitations, the present study examines GDP growth with an integrated framework of internal and external risks to assess their association with the financial sustainability of Indian banks. Based on the empirical and theoretical evidence, the researcher proposed the hypothesis as follows:

H5: GDP significantly negative influence the financial sustainability.

Inflation and Financial Sustainability

Inflation can influence the banks' return generating capacity through the repricing of interest bearing assets and liabilities, changes in operating costs and borrowers' repayment capacity. The Fisher Effect (Fisher, 1930) provides theoretical support by suggesting that nominal interest rates may adjust to expected inflation, however, the effect on banks depends on whether lending rates increase faster than deposit rates and operating expenses. Consistent with this, the existing literature also states that inflation positively influences the financial performance of financial and non financial firms (Tan & Floros, 2012; Terstena et al., 2023; Mateev et al., 2024; Ilbasmis, 2025; Maria & Hussain, 2025). In contrast, high inflation may erode banks' performance by increasing operating expenses, raising costs and weakening borrowers' repayment capacity (Ozili & Arun, 2022). Empirical studies in Nigeria, GULF Cooperation Council countries, and G20 nations highlighted the negative impact of inflation on banks' performance (Zeitun, 2012; Cetin, 2019; Nkwo, 2024). Thus, the existing studies concluded that the effect of inflation on the banking sector is not uniform. This provides a rationale for further empirical investigation.

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Nevertheless, the Fisher effect and the empirical evidence provide a basis for expecting inflation to improve the financial sustainability of Indian banks when interest rate adjustments adequately compensate for rising costs. Accordingly, the researcher proposed the following hypothesis:

H6: Inflation significantly negative influence the financial sustainability.

Research Gap

Despite extensive studies on bank performance, a significant gap remains in understanding how banks' earnings based sustainability is affected when internal balance sheet weaknesses coincide with external financial risks. Existing studies are valuable but largely focus on separate evidence, including asset quality studies on NPAs deterioration and studies on external financial influences on financial conditions, capital flows, credit and systemic risks. Consequently, researcher rarely integrate externally driven MPU and FSI with banks' internal credit risk to assess their capacity to maintain returns. This is important for India, which is increasingly influenced by international developments. Therefore, there is a need to expand the literature from the traditional analysis of internal risk to a more integrated understanding of how external risk shapes the financial sustainability of emerging economies, particularly India.

Data & Methods

The study employs an unbalanced panel consisting of 40 Indian banks from the CMIE Prowess database's banking service index from 2015 to 2024. The panel comprises a diverse mix of public, private, foreign and small finance banks, reflecting diversity in ownership, business orientation and institutional characteristics while operating under a unified Indian regulatory and macroeconomic framework. By including banks from various categories, this study ensures a broad representation of the Indian banking sector, thereby enhancing the relevance and validity of the findings. The study's period is significant as it captures the major economic and financial developments affecting the banking sector, such as banking reforms, shifts in monetary policy, rising NPAs, digitalisation expansion and the pre and post COVID 19 period. Annual financial data at the bank level extracted from the CMIE Prowess database, while GDP and Inflation data obtained from the World Bank's website. In addition, data on the MPU index (Husted et al., 2020) and FSI (Puttmann, 2018) collected from the Economic Policy Uncertainty website (https://www.policyuncertainty.com/). Since MPU and FSI data are available at monthly frequency, interpolated used to convert monthly data into annual frequency to align with bank level data. Additionally, Table 1 represents the acronyms, detailed definitions, and sources of the variables used in the study.

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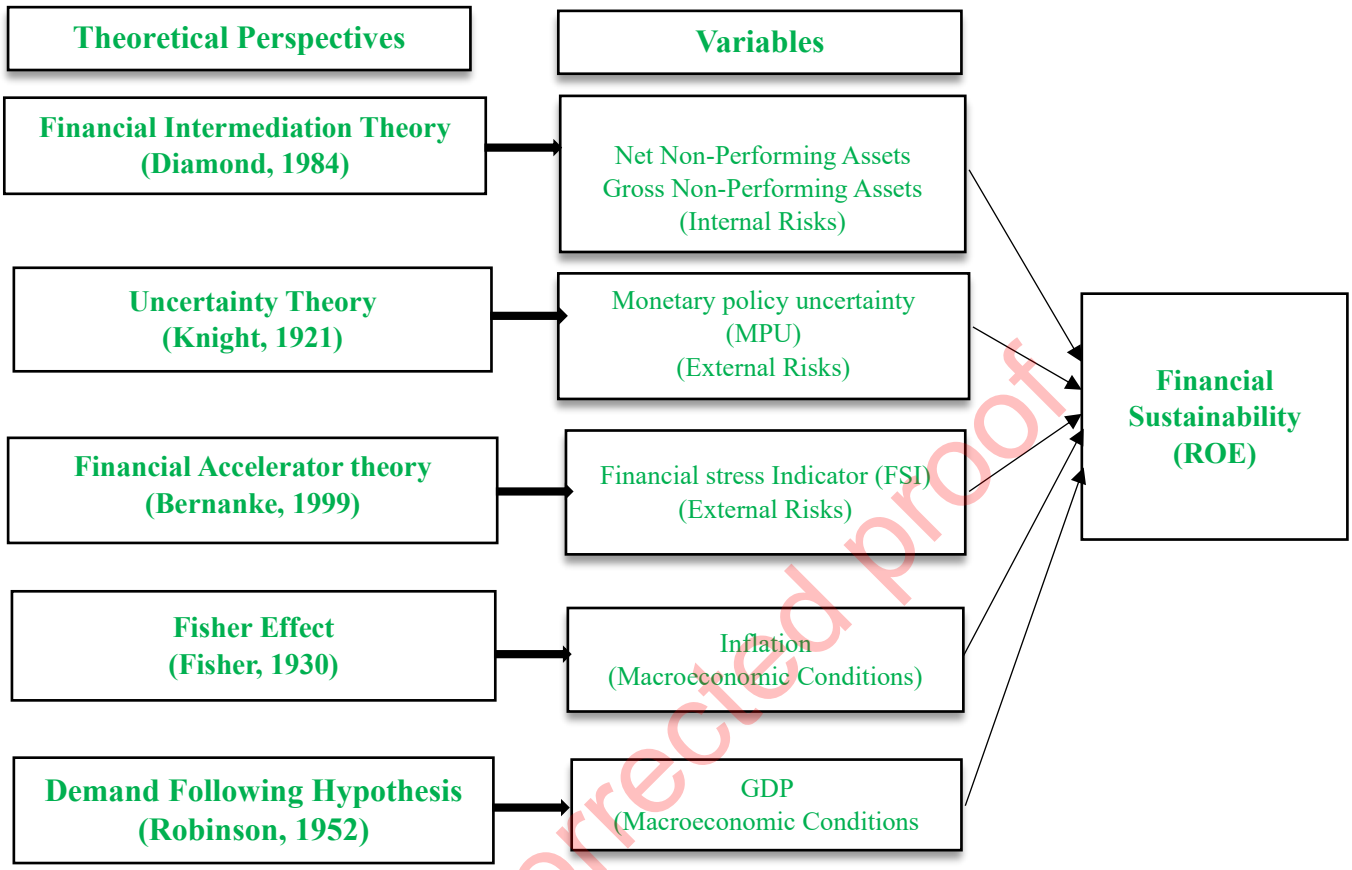
Table 1. Description of Variables

Variables	Proxy	Definitions	Acronyms	Sources
		Dependent Variable		
Financial Sustainability	Return on Equity	The ratio measures profit after tax divided by average net worth.	ROE	CMIE Prowess Database
		Independent Variables		
Internal Risk	Net non performing assets	NNPAs as the ratio of net advances, after specified adjustments for provisions	NNPAs	CMIE Prowess Database
Internal Risk	Gross non performing assets	GNPAs as the ratio of total advances.	GNPAs	CMIE Prowess Database
External Risk	Monetary Policy Uncertainty	A news based indicator that captures uncertainty surrounding monetary policy decisions and their potential consequences (Husted et al., 2020)	MPU	Economic policy uncertainty (https://www.policyuncertainty.com/)
External Risk	Financial Stress Indicator	Newspaper based indicator of financial stress derived from financial markets related titles and their negative sentiments across five major U.S. newspapers (Puttmann, 2018)	FSI	Economic policy uncertainty (https://www.policyuncertainty.com/)
Macroeconomic conditions	Gross Domestic Product	The percentage change from the previous year in gross domestic product measured at constant 2015 prices	GDP	World bank
Macroeconomic conditions	Inflation	The annual percentage change in the cost to the average consumer of acquiring a basket of goods and services, as measured through the consumer price index	INF	World Bank

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Figure 1 Conceptual Framework



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Econometric Model

The preliminary analysis is undertaken to identify a suitable econometric model for the study. The researcher employed the Wald test for heteroscedasticity (Greene, 2000) and the Wooldridge test for autocorrelation and confirmed the existence of heteroscedasticity and autocorrelation (Table 3). Traditional models, such as pooled ordinary least squares, fixed effects and random effects models, are inadequate for resolving this issue (Arellano & Bond, 1991). While investigating persistence, the researcher incorporated a lagged variable of the dependent variable as an explanatory factor, consistent with modern econometric models that frequently use dynamic structure in panel data analysis. However, the lagged variable can lead to an endogeneity issue if these variables are correlated with the error term (Ullah et al., 2018).

Therefore, Balestra and Nerlove (1966) made an early contribution to estimating dynamic panel data models by addressing the endogeneity that arises from including lagged dependent variables in the presence of unobserved effects. This approach employed instrument variables within two stage least squares (2SLS) framework to mitigate the bias caused by the correlation between lagged dependent variables and the error term. However, traditional 2SLS estimation does not fully account for unobserved individual specific effect characteristics of panel data, leading to biased and inconsistent estimates. This limitation promoted the development of more appropriate dynamic panel models, particularly the GMM model introduced by Arellano & Bond (1991).

The GMM model is effective in addressing endogeneity arising from unobserved variables affecting the dependent variables and reverse causality among variables (Ullah et al., 2018). It tackles endogeneity by applying an 'internal transformation' to the dataset, which is essentially a statistical technique where the previous value is subtracted from the current value (Roodman, 2009; Tubik & Herberger, 2026). The model reduces the number of observations, thereby increasing the efficiency of the GMM model through this internal transformation process (Ullah et al., 2018). There are two GMM estimation techniques, difference GMM (Arellano & Bond, 1991) and System GMM (Arellano & Bover, 1995). Each technique can be further divided into one-step and two-step processes. The difference GMM is based on the first differenced equation with lagged instruments, while System GMM combines both levels (level and difference). The study preferred the System GMM model over the difference due to certain limitations of the latter, particularly when the dependent variable resembled a random walk. Therefore, previous levels offer minimal insights into future change and transformed lags become ineffective instruments for the transformed variables (Blundell & Bond 1998; Roodman, 2009). Additionally, system GMM effectively corrects for unobservable country specific omitted variable bias and other endogeneity issues by incorporating the model parameters (Xaisongkham & Liu, 2022). Thus, the system GMM model is efficient for dynamic panel data, particularly when dealing with highly autoregressive data with a limited number of observations, where cross section group is larger than the time dimension (Roodman, 2009). Additionally, it not only enhances accuracy but also effectively reduces finite sample bias (Farzana et al., 2024) and remains consistent in the presence of heteroskedasticity and autocorrelation (Roodman, 2009; Arebo et al., 2025). Consequently, two system GMM models provide more efficient estimators than one step (Bakhsh & Shabir, 2021).

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To evaluate the model's validity, the researcher conducted post diagnostic assessments, such as the Sargan test, which examines the validity of instruments in the model. The Sargan test's null hypothesis posits that all instrumental variables are collectively exogenous, making it desirable to accept this hypothesis for the instruments to be considered valid. Moreover, to avoid proliferation or overidentification of instruments that could introduce bias into the GMM estimator, cause overfitting of endogenous variables and weaken the Sargan test, it is important to ensure the number of observations remains below the number of groups (Asongu and Nwachukwu, 2018). Furthermore, AR (1) and AR (2) and Arellano-Bond tests are employed to identify serial correlation. The null hypothesis of the AR(1) test indicates the absence of first order autocorrelation, while the AR (2) test's null hypothesis suggests no second order serial correlation. For unbiased results, it is crucial to reject the AR (1) test's null hypothesis and accept the null hypothesis of the AR (2) test (Arellano and Bover 1995; Blundell & Bond 1998; Wahab et al., 2017; Padhan & Bhat, 2024). As a result, two system GMM model is employed, utilising forward orthogonal deviations. Instrument proliferation is controlled by collapsing instruments and applying lag restrictions, while standard errors are clustered at the panel level. Accordingly, researchers articulate the following equation to check the hypotheses of the study;

$$ROE_{it} = \alpha + \beta 1 ROE_{(n-1)_{it}} + \beta 2 LnGNPA_{it} + \beta 3 LnNNPA_{it} + \beta 4 MPU_{it} + \beta 5 FSI_{it} + \beta 6 GDP_{it} + \beta 7 INFLATION_{it} + \varepsilon_{it}$$

In the above equation, ROE is the financial based proxy of the financial sustainability of banks, i^{th} bank at the t^{th} time period has a common set of independent variables such as $ROE_{(n-1)}$, GNPAs and NNPAs, which are the bank specific internal vulnerabilities, whereas MPU and FSI are external risks and GDP and inflation are the macroeconomic variables. The detailed explanation of the variables is given in Table 1, ε represents the error term, which shows the effect of unobserved factors on the ROE.

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Findings

Table 2 represents the summary statistics of the variables included in the study. The financial sustainability measured through ROE has a mean value of 2.361. This indicates that banks are generally financially sustainable but experience financial instability. The maximum and minimum value suggest substantial variability. In addition, the average GNPAs (13.858) and NNPAs (3.102) indicate moderate credit risk, reflecting asset quality deterioration. Moreover, MPU shows considerable variability with a mean value of 97.374 and a standard deviation of 42.378. However, the FSI indicates relatively low variability with minimum 99.360 and

maximum 100.235 values, suggesting stable but sensitive systematic conditions. The macroeconomic variables indicate moderate economic growth, with GDP having a 4.998 mean value and relatively stable inflation with a 4.991 mean value. Overall, the presence of variability, skewness and non normality across variables supports the use of dynamic panel techniques.

Table 2. Summary Statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
ROE	390	2.361	20.519	-190.816	54.849
GNPAs	392	13.858	7.676	1.120	53.620
NNPAs	391	3.102	7.603	0.030	141.000
FSI	400	99.736	0.259	99.360	100.235
MPU	400	97.374	42.378	51.637	182.345
GDP	400	4.998	4.212	-6.690	8.791
INF	400	4.991	1.074	3.328	6.699

Table 3 represents a correlation analysis, the coefficient value of all variables is less than 0.8 (Gujarati & Porter, 2004). In addition, the researcher also checked the VIF (see Table 3) and indicated that there is no presence of multicollinearity because the VIF values of the independent variables are not greater than 10 (Wooldridge, 2005).

Table 3. Correlation Analysis

	ROE	NNPAs	GNPAs	FSI	MPU	GDP	INF	VIF
ROE	1							
NNPAs	-0.325*	1						1.03
GNPAs	0.004	0.037	1					1.09
FSI	0.019	-0.016	-0.164*	1				1.12
MPU	-0.265*	0.128**	0.213*	-0.066	1			1.48
GDP	0.144*	-0.148*	-0.162*	0.119**	-0.534*	1		1.58
INF	0.129**	-0.017	-0.031	-0.265*	0.014	-0.268*	1	1.19
			Mean VIF					**1.25**

(Notes - *, ** and *** indicate 1%, 5% and 10% significance level)

The table 4 represent the modified Wald test (Greene, 2000) reject the null hypotheses of homoscedasticity across panel, indicating the presence of groupwise heteroskedasticity.

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Similarly, the Wooldridge test (Wooldridge 2002) also rejects the null hypothesis of no. of first order autocorrection.

Table 4. Diagnostic Tests

Diagnostic tests	Tests	T statistic	p-value	Assessment
Heteroscedasticity	Wald test	$\chi 2$ (40) = 9588.88	0.000 *	Presence of Heteroscedasticity
Auto-correlation	Wooldridge test	F (1,39) = 9.849	0.003**	Presence of Autocorrelation

(Notes - *, ** and *** indicate 1%, 5% and 10% significance level)

Therefore, the researcher used a two system GMM model to measure the impact of internal and external risks on the financial sustainability of Indian banks. The system GMM model's findings (Table 5) showed that the coefficient of the lagged dependent variable is 0.397, which has a significant positive impact on the ROE, suggesting persistence in financial sustainability. The findings showed that internal risk indicators have a mixed impact, such as the coefficient of NNPAs is -6.482 at the 1% significance level, while the GNPAs showed an insignificant effect on the ROE of banks. These results indicate that high net non-performing assets increase credit risk and provisioning requirements, thereby weakening the earning generation ability of banks. In addition, the FSI has a coefficient of 5.578 with a p-value of 0.036, indicating that the FSI has a significant positive impact on ROE. Whereas MPU shows a significant but negative impact on ROE, with a -0.055 coefficient and a p-value of 0.061. Regarding macroeconomic indicators, GDP has an insignificant impact on the ROE of Indian banks. In contrast, inflation also shows a significant positive impact with the 1.599 coefficient and 0.044 p-value, suggesting that moderate inflation may enhance financial sustainability through increased nominal revenues and interest margins.

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Table 5. Two step GMM Analysis

ROE	Coef.	Std. Err.	P>z
$ROE_{(n-1)}$.	0.397	0.075	0.000*
lnNNPAs	-6.482	1.774	0.000*
lnGNPAs	0.887	1.419	0.532
FSI	5.578	2.656	0.036**
MPU	-0.055	0.029	0.061**
GDP	-0.206	0.299	0.491
Inflation	1.599	0.793	0.044*
cons	-554.360	267.504	0.038
	Number of obs.		348

Number of Instruments		30
Number of groups		40
Sargan -Hansen test	(30.624) p = 0.104	H0: overidentifying restrictions are valid
AR1	0.005	H0: No autocorrelation of order1
AR2	0.374	H0: no autocorrelation of order

(Notes - *, ** and *** indicate 1%, 5% and 10% significance levels).

Table 6. Sensitivity Analysis (Covid 19)

ROE	Coef.	Std. Err.	P>z
$ROE_{(n-1)}$.	0.386	0.061	0.000*
lnNNPAs	-7.029	1.496	0.000*
lnGNPAs	0.315	1.059	0.766
FSI	6.213	3.209	0.053**
MPU	-0.036	0.029	0.212**
GDP	0.044	0.278	0.875
Inflation	1.050	0.762	0.168*
COVID 19	4.256	2.415	0.078
cons	-617.287	321.524	0.038
Number of obs.			348
Number of Instruments			30
Number of groups			40
Sargan- Hansen test	(27.888) p=0.143	H0: overidentifying restrictions are valid	
AR1	0.006*	H0: No autocorrelation of order1	
AR2	0.381	H0: no autocorrelation of order	

(Notes - *, ** and *** indicate 1%, 5% and 10% significance levels)

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As an additional sensitivity analysis, a Covid 19 dummy for the year 2020 introduced to account for the pandemic period shock. The findings showed a positive coefficient (4.257) but weakly significant at the 10% significance level, indicating a higher conditional level of banks' ability

to sustain returns during this period. This is consistent with evidence that Indian banking systems were able to handle the immediate effect of Covid 19, without facing major deterioration in overall banking performance (Gulati et al., 2023). In addition, the major findings remain stable, particularly the significant negative effect of NNPAs, while MPU and Inflation become insignificant after controlling for Covid 19.

Discussion

The study's findings show that the financial sustainability of Indian banks is shaped by internal vulnerabilities and external financial risks. The significant lagged ROE shows persistence in return generating capacity, implying banks with stronger ROE in the previous year tend to sustain relatively higher returns, consequently, financial sustainability has an inherently dynamic nature. Consistent with Sinha and Sharma (2016), Dogan and Yildiz (2023) and Bhatia and Kumar (2025), researchers suggest that persistence may arise from operational efficiencies, accumulated resources, lending capacities and stable customer relationships. Financial sustainability depends not only on the generation of accounting returns but also on managing the internal risks that may reduce their earning generation capacities.

The findings show that internal risk is relevant to banks' ROE based financial sustainability, while GNPAs and NNPAs capture different aspects of asset quality deterioration. This difference is theoretically meaningful because GNPAs represent the gross stock of non performing loans, whereas NNPAs reflect the portion of impaired loans remaining after provisions (RBI, 2021; Rosario & Mavuri, 2026).

The insignificant influence of GNPAs suggest that the gross accumulation of non performing loans does not necessarily lead to an immediate reduction in ROE, particularly when banks can absorb part of the associated risk through provisions and other loss absorption mechanisms. On the contrary, NNPAs show a significant negative effect, suggesting that once the available loss absorption capacity has been considered, the remaining impaired exposure can exert greater pressure on the resources available to generate shareholders' returns. This aligns with the financial intermediation perspective of Diamond (1984), where effective monitoring and management of credit exposures are central to banks' intermediation role. In addition, supported by recent empirical evidence (Gaur & Mohapatra, 2020; Das & Uppal, 2021; Ali, 2022; Bhatia & Kumar, 2025; Sen et al., 2026), our findings suggest that the residual burden of impaired assets, rather than the gross incidence of non-performing assets, is more closely related to the sustainability of shareholders' returns.

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Regarding external risks, findings reveal that the influence of external risks on Indian banks' financial sustainability depends on the nature of the risk considered. Although MPU and FSI both capture external sources of financial risk, they reflect different economic conditions and may therefore operate through distinct transmission mechanisms. MPU reflects uncertainty about future policy conditions, whereas FSI captures prevailing financial stress. From an uncertainty perspective, Knightian uncertainty (Knight 1921) and Bernanke' (1983) real options argument suggest that uncertainty can discourage decisions involving irreversible obligations. The finding of MPU is consistent with Danisman et al. (2020), Hamdi and Hassen (2021), Ozili and Arun (2022) and Huynh (2024), with the present study implying that higher MPU reduces the profitability of interest rates, funding conditions & asset valuations, making banks' investment and asset liability management decisions more difficult. Consequently, banks may adopt conservative lending behaviour, maintain precautionary liquidity reserves, reducing profitability and threatening financial sustainability (Husted et al., 2020; Ge et al., 2023; Ha & Dang, 2026).

The significant positive influence of FSI on ROE implies that financial stress in advanced economies influences the financial sector performance in emerging countries, particularly India. Consistent with Engler et.al. (2023), who showed that advanced economies' financial stress can spill over into emerging economies, although the effect differs across countries and financial connections. These variations appear in India, where Ghosh et al. (2025) identified a positive effect of financial stress on GDP during the Euro crisis and Covid 19 shock. Taken together, the current study suggests this positive effect is a distinct market association, not evidence that financial stress directly improves financial sustainability. Additionally, researchers suggest that if financial stress prompts the U.S. Federal Reserve to lower interest rates, the relative return advantage of U.S. investments may decline, shifting funds toward emerging countries like India. Likewise, if financial stress leads to exchange rate changes that improve Indian exporters' competitiveness, stronger export activity may support borrowers' repayment capacity and banks' return generating capacity. Such capital flows could support the Indian financial market and economic growth. In addition, domestic prudential safeguards and bank level risk management may help moderate the effects of external shock sentiments. The findings add bank level perspective and highlight the conditional nature of external risks to banks' financial sustainability.

Regarding domestic macroeconomic conditions, the insignificant impact of GDP on ROE is consistent with Kantharia and Biradar (2023) and Bhatia and Kumar (2025), implying that

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aggregate expansion alone may not be sufficient to generate measurable improvement in financial sustainability. According to the demand following hypothesis, economic growth stimulates demand for financial services, however, greater demand for banking services does not necessarily translate into higher returns for shareholders. However, the finding contradicts Jain et al. (2025) and Ho and Lim (2026), who reported a positive significant impact of GDP. This contradiction may be due to differences in bank composition, institutional framework and macroeconomic financial environments. From the researcher's perspective, GDP captures overall economic activity but does not reflect how effectively banks convert that activity into profits. The benefits of economic expansion may be offset by funding costs, operating expenses or credit losses. In contrast, a significant positive effect of inflation on banks' ROE may reflect banks' ability to maintain earnings as prices rise. According to the Fisher Effect (1990), expected inflation can be incorporated into nominal interest rates. If banks adjust lending rates more quickly than deposit rates, their interest margins and earnings may improve. Consistent with the previous studies (Batsinda & Shukla, 2019; Ilbasmis, 2025; Maria & Hussain, 2025), researchers imply that banks are more capable of sustaining their earnings during inflationary periods. Nevertheless, Ho and Lim (2026) argued a negative impact of inflation on ROE in Cambodian banks, indicating that the net inflation effect can vary across banking environments. The present finding may indicate that banks maintained their earnings despite inflationary pressures.

Overall, this study conceptualises financial sustainability as the capacity to sustain earnings over time under changing internal and external risks. By examining earnings persistence alongside internal credit risks and external risks, the study extends the literature on banks' financial sustainability, providing cautious empirical evidence of financial sustainability through the dimension measured by ROE.

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Robustness Analysis

To validate the findings of the main model, the researcher employed a quantile GMM model (Machado & Silva, 2019). The Quantile GMM model's findings (Table 7) are consistent and confirm the validity of the main findings of the study.

Table 7. Quantile GMM Analysis

ROE	Coef.	Std. Err.	p >z
$ROE_{(n-1)}$	0.298	0.056	0.000*
lnNNPAs	-7.189	0.860	0.000*
lnGNPAs	2.048	1.033	0.047**
FSI	6.079	2.138	0.004**

MPU	-.0631	0.023	0.010**
GDP	-.115	0.256	0.652
INF	1.561	0.752	0.038**
_cons	-604.632	214.119	0.005

*, ** and *** indicate 1%, 5% and 10% significance level.

Conclusion

The study investigated the financial sustainability of Indian banks by examining both internal and external financial risks. The significant insight of this study is that banks' financial sustainability cannot be fully captured by traditional profitability metrics based on the banks' specific characteristics. Instead, it provides the banks' ability to handle the internal weakness while navigating a fluctuating domestic and international financial landscape. The significant adverse impact of NNPAs on ROE indicates that net credit impairment can restrict income generation ability and increase risks related to provisioning and recovery requirements. However, the insignificant GNPAs indicate the total volume of stressed assets does not necessarily result in proportionality reduced sustainability. This differentiation is crucial as it suggests that sustainability consequences of credit deterioration depend not only on the presence of stressed assets but also on the extent of impairment remaining after loss absorption. The findings offer a stronger rationale for directing managerial focus towards the resolution of net credit impairment, rather than treating all NPAs as equivalent risk for the sustainability of banks. Additionally, financial sustainability is influenced by factors beyond the internal vulnerabilities of individual banks. The adverse effect of MPUs on ROE implies that increased uncertainty regarding future monetary policies undermines the financial sustainability of banks. Unlike direct changes in monetary policy rates, MPU signifies uncertainty about future policy settings, which influences the availability of information for the banks' future decision planning. The findings also underscore that uncertainty itself can be a source of financial risk, even in the absence of an actual change in monetary policy, this perspective also broadens the understanding of monetary policy effects beyond traditional views, highlighting the significance of policy predictability for financial outcomes at the bank level. Furthermore, greater financial stress in the U.S. financial environment is associated with higher ROE among Indian banks. The unexpected finding should not be interpreted as evidence that financial stress directly enhances banks' sustainability. Instead, it might indicate how external financial stress is absorbed and transmitted within emerging countries.

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India's prudential and supervisory framework may mitigate the adverse effects of international financial stress by maintaining risk management buffers. Additionally, domestic macroeconomic conditions also play a key role in improving the financial sustainability of banks. This study shows that banks' financial return capacity is associated not only with internal credit quality deterioration but also with external financial risks. Consequently, the findings yield two major lessons from this study. Maintaining asset quality is crucial for preserving banks' return generating capacity, making early identification and resolution of deteriorating credit exposure essential. The other is that international financial risk should not be viewed as uniformly harmful or beneficial, their implications depend on the environments through which they are conducted. Therefore, banks' financial sustainability requires attention to both domestic internal vulnerabilities and the broader international financial conditions. India's prudential and supervisory framework may mitigate the adverse effects of international financial stress by maintaining risk management buffers. The study shows that banks' financial return capacity is associated not only with internal credit quality deterioration but also with external financial risks. Consequently, the findings yield two major lessons from this study. Maintaining asset quality is crucial for preserving banks' return generating capacity, making early identification and resolution of deteriorating credit exposure essential. The other is that international financial risk should not be viewed as uniformly harmful or beneficial, their implications depend on the environments through which they are conducted. Therefore, banks' sustainability requires attention to both domestic internal vulnerabilities and the broader international financial environment conditions.

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Implications of the Study

The study offers several evidence based implications for emerging economies, particularly India. The negative influence of NNPAs underscores the necessity for efficient management of stressed credit exposure. From a managerial perspective, it is crucial to prioritise comprehensive credit assessments, early identification of vulnerable exposures, continuous monitoring and timely recovery and resolution.

In the context of external risks, the adverse impact of MPU on ROE underscores the importance of bank regulators incorporating significant external policy changes into proactive risk assessments and scenario analyses, rather than relying solely on internal metrics. Moreover, the notable positive influence of FSI on ROE indicates that international financial conditions should be included in comprehensive data set for proactive bank risk monitoring. This finding underscores the necessity for banks to evaluate their balance sheet under various international stress scenarios. Policymakers should also integrate global financial stress scenario into their

stress testing and vulnerability assessments. Both bank and policymakers must consider specific macroeconomic conditions with empirical significance, rather the relying exclusively on general economic growth indicators. Overall, the study suggests that financial sustainability of banks depends on the effective management of internal vulnerabilities and the ability to adapt to changing external financial conditions.

Research Gap

This study presents evidence regarding the impact of internal and external financial risks on the financial sustainability of Indian banks, while identifying several potential directions for future research avenues. ROE indicates earning based sustainability, however subsequent studies could explore additional dimensions of sustainability. Additionally, the inclusion of bank specific variables may offer deeper insights into how banks' resilience influences their response to external risks. Future researchers might also compare news based and market based indicators, thereby extending the current findings through alternative measurement approaches. These considerations define the scope and potential pathways for extending the existing literatures without limiting conclusion of the findings.

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