



RESEARCH PAPER

Climate Change Damages to Agricultural Loan Recoveries and Financial Stability: A Fresh Insight from a Developing Country

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ABSTRACT

This study investigates the impact of expected loan recoveries on the financial stability of Pakistani banks that are providing agricultural loans. The study explores short and long-run relationship, as well as its consideration of control variables and the potential impact of climate change factors on agricultural loans that add original insights to the existing literature on the nexus of farmers' loans and banks stability in Pakistan. This study assesses the impact of climate-induced losses to loan recoveries on the financial stability of Pakistani banks engaged in providing agricultural loans for the sample period from 2000 to 2021 in the presence of control variables such as non-performing loans, profitability, equity-to-liabilities ratio, and retained earnings-to-total assets ratio. It constructs a specially designed composite index to measure Climate Change based on long-term weather data and employ the ARDL (Auto-Regressive Distributed Lag) technique to estimate the short and long-run association of expected loan recoveries on the financial stability of Pakistani banks. This study finds that the recovery of agricultural credit from farmers has a negative impact on the financial stability of banks in the short run but a positive impact in the long run. This indicates that banks may be insuring agricultural credits against damage due to climate change factors such as heavy rains out of season and extreme temperatures. This study suggests the importance of strong collaborations with private-public partnerships to ensure the effective utilization of agricultural loans on the micro-level to avoid financial instability.

KEYWORDS Agricultural Finance, Environmental Impact, Financial Stability

Introduction

Agriculture credit is a key determinant of agriculture productivity in developing countries. However, the recovery of agricultural credit is one of the main issues especially in Pakistan due to its poor infrastructure and political and environmental uncertainty (Anka, 1992, p.143). Strict criteria to improve the recovery rate of agricultural credit along with the local supervision of farmers is needed otherwise the default rate of farmers may rise exponentially (Mehmood et al., 2012, p.449).

Though the different agricultural loan-granting institutions are working in Pakistan under the government policies to boost agri-production but are facing higher default rates of agri-credits as compared to other sectors. The challenge of credit recovery for financial institutions is very difficult to resolve amid the declining economic development in Pakistan. The causes of high-rate defaults include poor implementation of credit policies by banks to the high volatility in production and market prices of agri-products in Pakistan. The empirical pieces of evidence on the impact of credit recoveries on the stability of banking stability is relatively less studied area among researchers.

The empiric aims are to investigate the impact of expected agricultural loan recovery on the financial stability of the banking sector in Pakistan. The empirical study demonstrates how efficient loan recoveries from the agricultural sector play a critical role in bank stabilization and enabling banks to serve farmers by ensuring the continuity of their credit facilities with the assistance of the Government of Pakistan. This study assume that the relationship of agricultural loan recovery with the stability of the banking sector is positive and poor credit recovery is linked with the high default rates of agri-loan granting institutions. This study apply the ARDL technique to examine the dynamic impact of agricultural loans on the stability of the banking sector engaged in loaning to farmers in Pakistan using the data from 2012 to 2021.

According to the State Bank of Pakistan (SBP) report 2018, total non-performing loans amounted to Rs.623.6 billion. Such huge non-performing loans (NPL) amount provides further support to study the direct and indirect impacts of default rate on the stability of banks. The uncertain volatility of agricultural productivity may impact the credit recoveries that result in the poor financial stability of the banking sector in Pakistan. The stability of the banking sector plays a vital role in servicing the continuity of agricultural credit loaning to farmers.

According to Fredriksson et al. (2019, p.8), poor loan recoveries have a negative impact on the stability of banks and financial institutions in a variety of ways. NPLs erode the worth of financial assets and decrease the stability of financial institutions. Recently, Pakistan has been facing of its difficult economic conditions like an increase in inflation, KIBOR rates, and economic imports. These economic conditions make the farmers vulnerable and unable to pay off the complete debt. In this way, it affects the financial stability and economic growth of Pakistan. Therefore, this study assume that it is vital to examine the impact of loan recovery on the financial stability of financial institutions in Pakistan. This study solely look at agricultural good loan recoveries and their impact on financial institution stability. The findings provide the tools to develop policies and strategies for reducing the detrimental effects of low agricultural credit recovery on financial stability.

Financial stability is a need for both sustainable growth and economic stability. Loans backed by the value of the collateral guarantee provide the flow and distribution of financial resources to the most demanding economic sectors, whereas loans to the agriculture sectors are susceptible to climatic and economic risks. The availability of agricultural products in the market impact both the viability of the business and the sustainability of the planet.

To increase agricultural productivity by responding to causes of low recovery including implementing mitigation or adaptation measures to the agriculture sector against climate change. Supporting various financial aid initiatives for farmers to mitigate climate change, boost agricultural output, and maintain the stability of the financial sector may be difficult for developing nations like Pakistan. The banking industry may impact other sectors' financial stability and aspirations for economic growth as a result of non-performing agricultural loans.

The paper is organized as, the next section describes the empirical pieces of shreds of evidence on the impact of agri-credit recovery on the stability of the banking sector and section three outlines the methodology and the fourth section provides the analysis and discussion of this empirical study. In the last section, this study conclude

the findings and suggest recommendations for the policymakers, farmers, and other regulators.

Literature Review

Wang et al. (2020) studied the factors affecting the banks' credit recovery rate for the USA banks. They used the data from 1987 to 2015 and employed the two-state Markov switching model. They conclude that the credit spread, types of loans, credit size facility, mortgaged types of credit, and other firms' level and economic indicators positively and negatively impact the loan credit rates. They find that the collateral value against the size of the loan and the spread of credit rates significantly impact the recovery rates of the loan.

Bongini et al. (2019, p.237) used the data of 109 European banks and their holding corporations from 2006 to 2016. They found that the profitability of the banks significantly impacts the loan recovery rates and also concluded that the profitability depends on the rate of loan recovery, the portfolio management, and their policies regarding loan financing. Their study found that the banks can enhance their profitability by using more conservative loan policies and issuance of secured loans as well as having a strong systematic loan recovery department.

Ijaz (2019, p.49) examined the determinants affecting the loan recovery rates for agricultural credit in the Sahiwal district, Pakistan. They collected data from 110 farmers from ZTBL Bank branches in Sahiwal. Their study concluded that the recovery rates of agriculture loans depend upon economic activity, level of poverty, credit policies, and different other firm and economic macro indicators. The small farmers used the loan for non-productive purposes like weddings of siblings, etc, therefore the recovery of such agriculture loans becomes a challenge for the banks. The Special Assets Management (SAM) policies, third-party involvement in the loaning process, expensive loans, and non-arrest powers, are impacting the recovery of the non-performing loans (NPL) and the decline in the bank's profit.

Kumar et al. (2020, p.254) found that various micro-level factors impact access to bank financing among Eastern agricultural farmers. Their study employed the double-hurdle Cragg model from 2002–2003 and 2011–2013 to analyze the farmer's structure changes during this period. Their study found that the family size, loan size, operated land, gender of the head, cast, education, and livestock have significant impacts on access to banks' credit facilities. They concluded that farmers from underdeveloped regions, those with less education, and those with small holdings still have difficulty accessing institutional funding despite the government of India's efforts to help them become financially empowered. They suggested that the main goals of the minimal requirements for collateral are to foster financial literacy and group initiatives to launch significant programs for underdeveloped regions.

According to the empirics of Ghosh (2018,p.230) from 1999-2016, the USA banks with more diverse portfolios, regulated capital, greater profitability, and cost-effectiveness have better recovery of loans. The idea of "too big to fail" exists in larger banks motivating them to follow a credit-liberal strategy. Therefore, there is a good correlation between bank size and banks' non-performing loans. They evaluated their impact on the loan recovery rates for the various economic sectors, including agriculture production and farm loans, by using the various factors, including ROA, and assets management calculated as total loans to total assets ratio and deposit to asset ratio. Their

study concluded that the bank's size, total deposits, and return on equity have positive but insignificant effects on banks' agricultural loan recovery rates. They concluded that the size of banking loans positively impacts the profitability and performance of banks. The farmers' loan payments depend upon the price of the loan, the production of crops, and the interest rate of the banking sector. The total deposits and return on equity are positively related to the agricultural credit rate.

Nguyen (2021, p.66) studied the firm characteristics of the capital adequacy ratio (CAR) of the Vietnamese banking sector from 2010 to 2020. He used GMM methodology to assess the impact of ROA, ROE, deposits, total assets, and NPL on CAR ratios. He found that the higher CAR is linked with higher performance of banks to absorb the shocks of the financial crisis and nonperforming loans. Further study found that CAR is negatively related to the profitability of banks and positively related to the recovery rates of banking loans.

Similarly, Wood and Skinner (2018, p.51) examined the firm and economic level indicators as the determinants for the prediction of NPLs for commercial banks in Barbados. The bank-level variables include loan to deposit ratio, ROA, ROE, and capital adequacy ratios significantly impact the level of NPL across all the banks. Their study concluded that to reduce the non-performing loans of banks, the quality of assets needs to be improved and conservative banking policies can improve the quality of assets in banks.

This study point out and establish a connection between the literature review and the financial stability of Pakistani banks based on the size of agricultural credit recoveries that are expected. The stability of the banking sector is measured with the capital adequacy of banks and liquidity ratios while the NPL is taken as a proxy for recovery rates of NPL. The control variables include ROA, ROE, and retained earnings to total assets.

Financial instability comes from different mismanagement actions in allocating financial resources, poor investment decisions, focusing on the net value of borrowers, weak financial structures that do not digest the minor shocks in the economic cycles, politicians' roles for their short-term political objectives, and others. Financial stability has gotten the attention of the Central Banks and International Financial and Monterey institutions, including IMF, over the last two decades. Financial stability concerns the financial system's possible operational disturbances and the degree to which it can observe financial stresses (Schinasi, 2004, p.11).

Financial instability results from various inadequate management actions in assigning financial resources, focusing on borrowers' net worth, inadequate decisions regarding investments, weak financial structures that fail to absorb minor shocks in the country, political and social factors, and externalities. Central banks and internal money supply regulators like the IMF have focused on financial stability. Financial stability refers to "the financial system's ability to withstand operational disruptions and the extent that it can withstand financial pressures" (Schinasi, 2004, p.11).

Fredriksson and Frykstrom (2019, p.10) studied the linkages between the NPLs and the financial stability of the banking sector and found that the NPL adversely affects the stability of banks at the micro and macro levels. Their study also concluded that the recovery of agri-loans positively influences the financial stability, profits, and liquidity

of banks in the long run. Creel (2014, p.9) employed a financial stability index and concluded that financial stability positively affects economic development.

The relationship between non-performing loans and financial stability can be theoretically explained with the help of moral hazard and too-big-to-fail theories. The moral hazard theory proposed by Berger and DeYoung (1997, p.865), describes the inverse relation between equity buffers and risk of borrowing. On one side the small banks take more risk to increase their profit on the other side, the large banks believe that the government may save them to maintain economic stability and hereby support them in taking large risks without any major hazard.

The efficiency theory argues that low-profitable banks tend to invest in more risky projects and an increase in debt cause to increase in NPLs and a decline in the stability of the financial sector (Berger & DeYoung, 1997, p.860). The soundness of financial organizations is determined by their earnings or positive income cash flows. Since their assets exceed their earnings, which can lead to financial instability. Financial institutions should pay attention to their liabilities since the rise in liabilities is greater than the growth in equity, which might be another factor contributing to the financial institutions' instability.

Wahab et al. (2022, p.10) conducted a micro-study of the eighty-two districts of Pakistan to find the impact of climate-induced agricultural loan recoveries on the financial stability of commercial banks. They found that agricultural loan recoveries positively impacted the financial stability of Pakistani commercial banks in the long run whereas negatively impacted in the short run. Wahab et al. (2024, p.247802) found that climate change has a negative impact on the yield of crops which also negatively impact the agricultural loan recoveries.

Shaw et al. (2013, p.130) studied the impact of CAR on the financial stability of the banking sector by developing a dynamic equilibrium model to investigate the implications of CAR. Their study found that CAR is negatively linked with financial instability and equity of the banking sector can be used as a buffer to absorb the losses of banks. The monetary policy moderated the channel of influence of CAR on financial stability.

Braima (2021, p.308) investigated the impact of bank and country-level indicators on the CAMEL regulatory framework for the GCC Islamic banks. He found that ROA, ROE, and debt ratio are positively linked with the Z-score, and the CAMEL framework also positively influences the Z-scores. However, the relationship between performance and CAR is conflicting in the literature. The studies of Amendola et al. (2021, p.243) and Raouf and Ahmed (2020, p.9) found a positive relationship while the Daoud and Kammoun (2020, p.366) and Boulanouar et al. (2021, p.5) found them negative. However, the relationship between profitability and CAR may be negative in the short run but can be positive in the long run.

H₁: Agriculture loan recoveries improve the financial stability of banks in the short run and long run

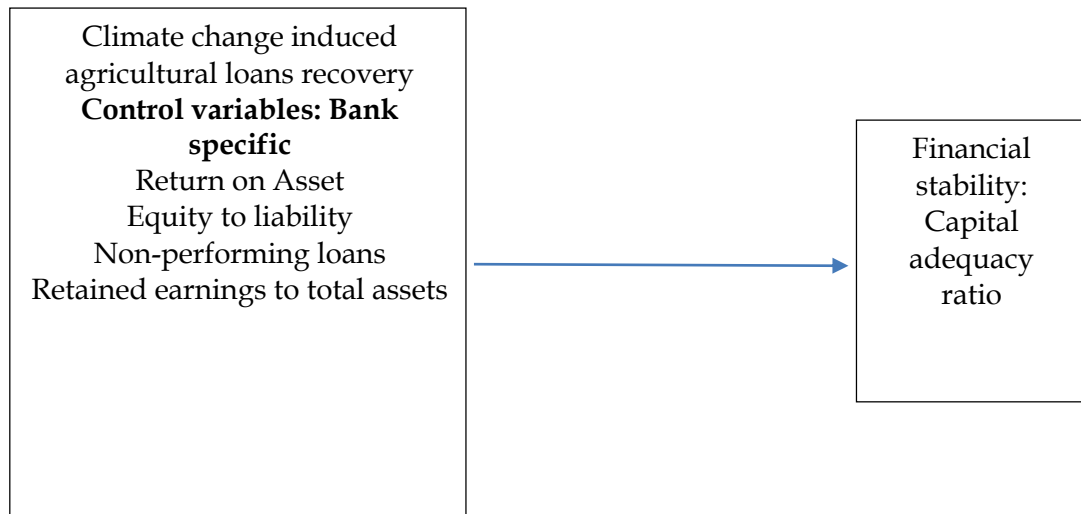


Figure 1: Conceptual framework

Material and Methods

Variable Definitions

Table 1
Proxy of Model Variables

Variable	Definition	Sources of data
Financial stability	Capital adequacy ratio	SBP
Agricultural loan recoveries	Yearly averages of expected values of agricultural loan recoveries derived from model-2	
Profitability	Return on assets ratio of the banking sector	SBP
Leverage	Equity to liability ratio of the banking sector	SBP
Non-performing loans	Total advances to gross loans ratio of the banking sector	SBP
Retained earnings to total assets	Un-appropriate profits to total assets ratio of the banking sector	SBP

Model Specification

Small farmers borrow from financial institutions to fulfill their agricultural input needs and repay upon the sale of crops. According to SBP, a 976.6 billion Rupees loan was granted to the agriculture sector in 2017-18 with an increase of 38.1 percent, compared to the previous year's amount of 704.5 percent. Agri-loans can enhance the productivity and economic growth of Pakistan. However environmental factors like climate change and unseasonal rain can adversely affect the production and make them difficult to repay the amount. In contrast, a friendly climate can positively enhance the production and loan recovery of banks. Therefore, loans can impact the financial stability of a bank in more than one way (Fredriksson and Frykstrom, 2019, p.13).

The following model is used to estimate the impact of agricultural loan recoveries on the financial stability of financial institutions.

$$FS_t = \beta_0 + \beta_1 Total\ recoveries_t + \beta_2 ROA_t + \beta_3 Eq_liab_t + \beta_4 NPL_t + \beta_5 RE_assets_t + \varepsilon_{it} \quad (1)$$

Where t = time frame; β_0 = is slope-intercept; ε_{it} = represents the error term, while β_1 - β_5 are the coefficients of model regressor variables: expected agricultural loans recoveries, profitability, equity-liabilities, non-performing loans, and retained earnings to assets ratios

The data is checked for the integration order of each variable first and then the integration ranking through the unit root test. Stationarity of data is imperative to obtain unbiased results (Haseeb et al., 2018, p.351). This study apply the Augmented Dickey-Fuller (ADF) test and different diagnostic tests to check the reliability and validity of the model results. This study prefer to use the Autoregressive Distributed-lag (ARDL) based on the stationarity test. The model variables are stationary at $I(0)$ and $I(1)$. Further, this study apply the ARDL bound test to check the model variables' co-integration. ARDL is a modified version of the classical OLS. It is preferred to use time series variables that have a mixed order of integration (Pesaran & Shin, 1995, p.101).

The following equation-2 presents the econometric functional form of the ARDL model:

$$CAR_t = \beta_0 + \theta_0 CAR_{t-1} + \theta_1 total\ recoveries_{t-1} + \theta_2 ROA_{t-1} + \theta_3 Eq_liab_{t-1} + \theta_4 NPL_{t-1} + \theta_5 RE_assets_{t-1} + \sum_{i=1}^a \beta_i \Delta CAR_{t-i} + \sum_{i=0}^b \gamma_i \Delta Total\ recoveries_{t-1} + \sum_{i=0}^c \delta_i \Delta ROA_{t-i} + \sum_{i=0}^d \lambda_i \Delta Eq_liab_{t-i} + \sum_{i=0}^e \vartheta_i \Delta NPL_{t-i} + \sum_{i=0}^f \psi_i \Delta RE_assets_{t-i} + v_t \quad (2)$$

Where Δ presents the first difference operators, β_0 is the slope intercept, ε_t represents error terms.

The extended forms of the influence variables are shown in the following equation 3:

$$\theta_0 CAR_{t-1} + \theta_1 total\ recoveries_{t-1} + \theta_2 ROA_{t-1} + \theta_3 Eq_liab_{t-1} + \theta_4 NPL_{t-1} + \theta_5 RE_assets_{t-1} + \sum_{i=1}^a \beta_i \Delta CAR_{t-i} + \sum_{i=0}^b \gamma_i \Delta total\ recoveries_{t-1} + \sum_{i=0}^c \delta_i \Delta ROA_{t-i} + \sum_{i=0}^d \lambda_i \Delta Eq_liab_{t-i} + \sum_{i=0}^e \vartheta_i \Delta NPL_{t-i} + \sum_{i=0}^f \psi_i \Delta RE_assets_{t-i} \quad (3)$$

Where CAR_t shows the financial stability of banks at year t

Total recoveries show the average estimated recoveries of agricultural credit at year t by using the following equation 4:

$$Total\ Recovery_{it} = \alpha_0 + \alpha_1 Expected\ climate\ Sensitivity_{it} + \alpha_2 Expected\ climate\ Sensitivity\ Dummy_{it} + \alpha_3 Spread\ rate_{it} + \alpha_4 Loa\ Size_{it} + \alpha_5 ROA_{it} + \alpha_6 Bankd\ Deposits_{it} + \varepsilon_{it} \quad (4)$$

Where ROA_t presents the return on assets of banks at year t , Eq_liab_t presents the equities to liabilities ratio of banks at year t , NPL_t presents the non-performing loans of banks at year t , and RE_assets present the retained earnings to assets ratio of banks at year t

Results and Discussions

Descriptive Statistics

Table 2 presents the descriptive statistics of the data set. The CAR ratio has an average of 13.60 percent representing the financial stability of banks. It has a minimum value of 8.50 and a maximum value of 18.56. The estimated proxy variable for loan recoveries has an average value of 6.35 with a minimum value of 6.27 and a maximum value of 6.41. The ROE ratio of banks has average profitability of 1.76 with a range of 0.50 to 3.07. Leverage is presented with an equity to liabilities ratio having an average value of 0.09 with a minimum value of 0.07 and a maximum value of 0.10. The NPL is 0.12 on average, with a minimum of 0.07 and a maximum of 0.24. The earning-to-total assets ratio has a mean value of 0.01, with a range of 0.03 to 0.001. Overall the data shows that the values are in the normal range and unbiased.

Table 2
Descriptive Statistics of Financial Stability

Variable	Observations	Mean	S.D	Minimum	Maximum
Capital adequacy ratio	21	13.63	3.13	8.50	18.56
Natural log of the predicted variable of loan recoveries	21	6.35	0.04	6.27	6.41
Return on Assets	21	1.76	0.62	0.50	3.07
Equity to liabilities	21	0.09	0.01	0.07	0.10
Non-performing loan ratio	21	0.12	0.05	0.07	0.24
Retain earning to assets ratio	21	0.01	0.01	0.001	0.03

Stationarity Tests

Table 3 presents the stationarity test of Augmented Ducky Fuller (ADF). This study finds that variables of CAR, equity liabilities, and predicted loan recoveries are significant at I(1). While the variables of NPL, ROA, and retained earnings assets ratios are significant at I(0).

Based on the stationarity test, this study prefers to use ARDL regression to test hypothesis H1 which states that loan recoveries impact the financial stability in the presence of selected control variables i.e. Equity liabilities, profitability, and NPLs.

Table 3
Stationarity Test of Financial Stability Model

Variables	Level	1st difference
CAR	-2.45	-3.48*
Natural log of the predicted variable of loan recoveries	-2.00	-6.67*
ROA	-3.70**	-4.28**
NPL	-3.67***	-2.03**
Equity liabilities	-1.59	-4.48***
Retain earning _assets ratio	-3.52*	-4.18**

Notes:***, **, * presents the significance of variables at 1%, 5% and 10% level

Correlation Matrix

Table 4 shows the correlation matrix. CAR is correlated with agri-credit recoveries and has a coefficient value of 0.742. The ROA and retain earning_total asset ratios are negatively related to equity, and liabilities with a coefficient value of 0.6303. Similarly, the CAR ratio is positively correlated to NPLs with a coefficient value of 0.5832. The agricultural credit ratio is positively correlated with ROA and negatively correlated to equity_ liabilities. The NPL is positively correlated with profitability. It shows that credit recoveries are linked with the financial stability of banks. The banking sector may increase profitability and financial stability by increasing the recovery of agricultural loans.

Table 4
Pearson Pairwise Correlation Matrix

	CAR	Predicted loan recoveries	ROA	Equity_liabilities	NPL	Retained earning_ assets
CAR	1					
predicted loan recoveries	0.742	1				
ROA	0.324	0.357	1			
Equity_ liabilities	-0.630	-0.607	0.037	1		
NPL	-0.583	-0.653	-0.53	0.416	1	
Retained earning_ assets	0.779	0.753	0.3001	-0.653	-0.68	1

The values of coefficients of all variables vary from 0.779 of CAR and retained earnings _assets to 0.037 between the ROA and equity liabilities. Therefore, this study concludes that no serious multicollinearity issues among the variables are absent.

ARDL Regression

Pesaran/Shin/Smith Bounds Test

The bound tests for co-integration by Pesaran (2001, p.301) are shown in Table 5. The Bond test's F-statistic (30.951) is higher than the upper bound values, indicating the presence of co-integration between the vector of exogenous variables (estimated agricultural credit recoveries, ROA, equity-liabilities, NPLs, and retained earnings-assets) and CAR over the long term. This study uses the Akaike information criterion (AIC) to choose the proper lag for the model variables. Based on AIC, the analysis determines that the lags for predicted agricultural loan recoveries, ROA, equity-liabilities, NPLs, and retained earnings-assets are 1, 1, 1, 1, 1, 0, respectively.

Table 5
ARDL Bounds Test of Co-Integration of CAR

F Statistics	Significance level	The critical values for the bound test	
		Lower Bound	Upper Bound
30.951, K =5 (lag : 1,1,1,1,1,0)	10%	2.26	3.35
	5%	2.62	3.79
	2.5%	2.96	4.18
	1%	3.41	4.68

ARDL Regression

Table 6 shows both short-run and long-run associations among the variables. The agricultural loan recoveries and equity liabilities negatively impact the CAR of Pakistani banks; ROA and NPLs positively impact CAR in the short run. In the long run, NPLs negatively impact CAR, ROA is insignificant, and other model variables such as loan recoveries, retained earning assets, and equities-liabilities positively impact CAR. The error correction (ECM (-1)) is negative and significant, which means that the CAR of banks comes from the loan recoveries in the disequilibrium and is adjusted at the speed of 86% in the long run. The R-squared value presents that the model is explained by 97% of variations in the model variables. The F-statics of the model show that the model is fit for this study.

As per the analysis results, the CAR is affected by the agricultural loan recoveries which shows that the banks can absorb the shocks of NPLs and recoveries have a positive impact on financial stability. Similarly, CAR is linked with ROA, equities_liabilities, and NPLs by having a significant impact. It means that banks can absorb losses. The quality of a bank's loan portfolio significantly depends upon the agricultural loan recoveries. When farmers repay the loan timely, the credit risk of the bank is mitigated and loan defaults decline accordingly. The higher agricultural loan recoveries also impact the ROA of banks and provide more capital buffers to absorb losses. A similar significant factor that affects the banks' CAR ratio is ROA. A greater ROA shows that the banks are making a greater return out of the assets they have invested in, which helps to strengthen their capital position and raise their CAR ratio.

The Equities_liabilities variable is also significant for the banks' ability to handle the losses and liquidity issues. It also includes deposits by customers and short-term loan facilities from other financial institutions. NPLs increases when the production of crops decline due to unfavorable climate system. It also reduces the CAR of banks. Retained earnings_assets represent the undistributed dividends payments or retained earnings from the profits which means that the higher retained earnings enhance the banks' capital base.

The results of this study contradict those of De Servigny and Renault (2004,p.10) and Castro and Garcia (2014, p.510). They discover that delayed recoveries result in bigger losses for urban banks, increasing the likelihood of challenges with adequate capital adequacy ratio in the financial sector. Banks in Pakistan may have more successful recovery processes, such as the collateral value of farms and group guarantees. The loans put farmers under indirect pressure to repay their agricultural debts timely. According to Abusharba et al. (2013, p.160), ROA has a favorable influence on CAR, but NPL has a negative impact on CAR. Nguyen (2021,p.67) discovers that NPLs have a deleterious influence on the CAR. According to Al Salamat and Al-Kharouf (2021, p.29), ROA and assets ratios have a significant influence on the financial stability of Jordan's banking system.

This study concludes that banks with credit good repayments, Retained earnings assets ratio, ROA, and Equities liabilities ratio, tend to have a better CAR ratio thus good financial stability. In this way, the banks absorb the losses and remain financially stable in the long run.

Table 6
Long-run and Short-Run Estimation of Financial Stability

Dependent Variable CAR, lag(1,1,1,1,0)							
Long-run				Short-run			
Variable	Coefficient	T-Values	P-Values	Variable	Coefficient	T-Values	P-Values
Agricultural loan recoveries	76.0131***	12.26	0.000	Δagricultural loan recoveries	-60.53***	-6.37	0.000
ROA	.1105	0.55	0.598	ΔROA	1.6949***	11.19	0.000
Eq-liabilities	26.532*	2.04	0.076	ΔEq-liabilities	-45.085***	-4.28	0.003
NPL	-9.085**	-2.89	0.020	ΔNPL	7.212**	2.15	0.064
RE_assets	95.388**	2.94	0.019	Δ RE_assets	159.67**	2.57	0.050
Constant	-407.6***	-5.87	0.000	ECT(-1)	-.8638***	-8.06	0.000
R-square is 0.98, Adjusted R-square is 0.95							

*** indicates 1 %, ** indicates 5 % and * indicates 10% level of significance

The findings of the diagnostic tests have been used to check the consistency of the ARDL results as shown in Table 7. According to the Breusch-Godfrey LM, Breusch-Pagan, ARCH, and Jarque-Bera tests, serial correlation, heteroskedasticity, and residual distribution are not significant problems.

Table 7
Diagnostic Tests of Financial Stability

Tests	X ² (P value)	Result
Breusch-Godfrey LM	0.1191	Absence of serial correlations
Breusch-Pagan	0.1423	Absence of heteroskedasticity
ARCH	0.3524	Absence of heteroskedasticity
Jarque-Bera	.3522	Estimated residuals are normal

This study also checks the stability of the model by testing the CUSUM and CUSMSQ tests (Brown et al., 1975, p.151). Figure 1 presents the CUSUM and CUSUM square graphical tests to indicate the stability of the model and the validity of the tests to present the impact of agricultural loan recoveries on the financial stability of Pakistani banks.

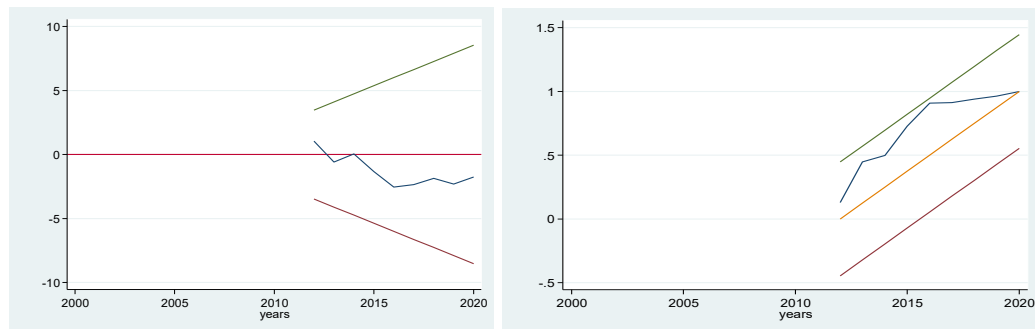


Figure 1 CUSUM and CUSUM of Squares Source: STATA Output

Conclusion

This study aimed to investigate the impact of expected agricultural loan recoveries on the financial stability of Pakistani banks that are offering agricultural loans. This study estimated the agricultural loan recoveries on an annual basis to examine their impacts on the financial stability of Pakistani banks. This study found that all the model variables are integrated at different levels of integration, i.e. $I(0)$ and $I(1)$. Therefore, ARDL regression is a suitable tool to test the impact of loan recoveries on the financial stability of Pakistani banks. This study concludes that agricultural credit repayments negatively impact the financial stability of banks in the short run. The increase in agricultural loan recoveries tends to increase the profitability and liquidity of banks and provide sustainability to agricultural credit schemes. However, loan repayments positively impact the financial stability of Pakistani banks in the long run. The possible cause of this contradiction may be the costly legal procedures to recover the agricultural credit having financial stability costs. The disequilibrium adjusts at the speed of 86% annually in the long run.

The control variables of this study i.e. non-performing loans, profitability, equity to liabilities, and retained earnings to total assets ratio have a positive impact on the financial stability of banks in the short and long run. The effects of control variables tend to increase in the short run than in the long run.

Recommendations

This study suggests various policy implications to farmers, regulators, managers of the banking sector, and other stakeholders according to the results of this study. According to short-run findings, agrarian loan recoveries hurt financial stability, thus there is a dire need to mitigate these negative effects by implementing new initiatives. To begin, banks may implement insurance programs to cover the risks of agricultural loans that might not be repaid owing to harsh climatic conditions such as excessive rains, floods, and so on. Second, there are different approaches to implementing efficient agricultural credit systems. Collaborations with government departments may be formed to define the requirements for granting loans against crops. In this approach, the agricultural loan may be closely managed to ensure that it is used for crop production rather than other reasons by farmers.

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