

The Impact of Climate Induced Agricultural Loan Recovery on Financial Stability; Evidence from the Emerging Economy Pakistan

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ABSTRACT

Financial stability acts as a backbone for economic stability and sustainable growth. The flow and allocation of the financial resources to the most demanding economic sectors by ensuring the loans against their collateral values, but the loans to the agriculture sectors are sensitive to the climatic uncertain factors. The climate change crisis motivates us to explore the impacts of the climate change induced agricultural loan recovery on financial stability. In particular, we study whether a decline in agricultural loan recovery has any impact on financial stability. We use a panel of 82 districts over a period of 21 years i.e., 2000-2020 to estimate the impact of climate change induced agricultural loan recovery on financial stability. We apply Autoregressive Distributed lag (ARDL), Regression to estimate the impacts of climate change induced agricultural recovery on financial stability across the sampled districts. We find that the impact of climate induced agricultural loan recoveries and equities to liabilities ratio negatively impact the financial stability of Pakistani banks; profitability and non-performing loan (NPLs) positively impact the financial stability in the short run. In the long-run, NPLs significantly negatively impact the financial stability, return on assets is insignificant and other model variables loan recoveries, the retained earnings to assets ratio, and equities to liabilities ratio positively impact the financial stability

1 Introduction

Financial stability acts as a backbone for economic stability and sustainable growth (Raouf and Ahmed, 2020). The flow and allocation of the financial resources to the most demanding economic sectors by ensuring the loans against their collateral values, but the loans to the agriculture sectors are sensitive to the climatic uncertain factors and slower the loan recoveries (Castro & Garcia, 2014). Since this century is crucial to the environment and planet sustainability and threatens food security and other agricultural products for the industrial growth (Richards, Lupton, & Allwood, 2021). Thus, the loans to such sector need supportive financial programs to improve agriculture productivity by responding to the climatic changes by adopting the mitigating or adaptation techniques. It is very hard for the developing economies like Pakistan to facilitate the farmers by promoting the different financial supportive programs to respond the climate change and increase the agricultural productivity by keeping the stability of the financial sectors on the other side. The non-performing agriculture loans can lead the banking sector to disturb the financial stability and other economic growth targets in the other sectors.

As in the prior two models, the study expects that the climate change differently impacts the agriculture productivity across the districts of Pakistan and the climate change productivity influences the recovery of the agriculture loans across the districts.

Okam (1994) argued that one of the most important resource inputs promoting agricultural development is agricultural finance. According to Akpaeti, (2015) contribution of agricultural financing to the national economy cannot be overemphasized in view of its relevance in stemming hunger and assuring food security, reducing unemployment, solving balance of payment problem and increasing GDP. Udoh (2008) is of the view that lenders grant productive credit to their customers under the condition of imperfection. So, based on the chronological development of the agriculture institutional credit in Pakistan along with the challenges of the recovery from the farmers need to investigate. We find the lack of the empirical quantitative study that captures the impacts of agricultural loans recoveries across the eight-two districts of Pakistan on the financial stability of Pakistan. We have primary objective to investigate how the loans recoveries from the farmers, by assuming that farmers ability to pay the agricultural loan mainly depend on the agricultural income, impact the financial stability of banking sector of Pakistan.

So, in this paper, we highlight and link the literature review to the financial stability of banks in Pakistan based on the volumes of the agricultural predicted loans recoveries from the model 2. The study also prefers to use the other control variables such as return on assets, equities-to liabilities, non-performing loans, and retain earning to total assets. We use capital adequacy proxy to capture the financial stability of Pakistani banks.

2 Literature Review and Hypothesis Development

Financial stability plays a significant role to maintain the economic growth and smoothly operations of the financial sector. It is concerned with the ability of the financial sector to observe the shocks come from the economic cycles and effective supervision of advances to different sectors including the agriculture. Moreover, financial stability significantly comes from the effective allocation of the economic resources and management decisions and attracting attentions of the Central Banks and International Financial and Monterey institutions including IMF over last the two decades (Schinasi, 2004).

The agriculture credit helps farmers to improve their living standard by adopting the modern cultivation methods. The Government of Pakistan has an intensive program to finance the farmers in growing and developing the agricultural sector. The main objectives to reduce the food insecurity and support the agriculturally based export industries like textile. Farmers usually need loans to fulfill their agriculture needs. According to SBP sources in financial year 2017-18 alone, 976.6 billion Rupees of loan was granted to agriculture sector. This showed an increase of 38.1 percent over the volume of agriculture loan granted in 2016-2017 i.e 704.5 billion Rupees.

Agriculture loan is one factor that may help farmers in enhancing farm productivity. However, farm productivity depends on a host of factors. One of the important factors that decides farm productive is climate. Unfavorable climate changes adversely affect farm productivity and some of the times, farmers fail to cover the cost of production due to lower output, while favorable climate conditions increase the farmers' income due to the increase in the productivity. Non-performing loans may the potential risks of the financial instability whereas loan recoveries may the potential support for the financial stability. These non-performing loans negatively affect the financial stability of financial institutions and higher rates of the loan recoveries support the FS of the commercial and rural banks to further support the agricultural lending. Non-performing loans or slow recovery rates not only reduce banks profitability but also negatively affect liquidity position of these financial institutions, which is an indicator of financial stability, whereas loans recoveries positively impact the financial stability and profits of the financial institutions and improve their liquidity. Creel (2014) formulated financial stability index and found that financial instability negatively affects the economic growth.

According to Fredriksson and Frykstrom (2019), bad loans adversely affect the stability of banks and financial institutions in many ways.

The recoveries of agricultural loans from the farmers are also sensitive to the agricultural commodities price. So, the market prices of the agricultural products need to cover the agricultural inputs including financial cost of agricultural loans. Castro and Garcia (2014) investigate the impacts of commodity price volatilities and climate change on the agricultural lending in Colombia over the period of 2005 to 2012 by applying GLMS regressions. They find that climate change and higher volatilities positively impact the agricultural lending. They conclude that rural banks in Colombia have facing the risk management challenges due to the climate change and higher volatilities of agricultural products and the challenges boost due to the sponsorship of the agricultural loans from the government to develop the agricultural sector. Their stress tests findings support that climate change factor has more significant impacts on the default risks of the rural banks in Colombia than the volatilities of agricultural products prices. The default risks come from the unfavorable climate changes that reduce the loan recoveries from the farmers and rural banks may expose to financial instability.

The credit risks with the likelihood of non-repayment of debt by the farmers is characterized with loan recoveries as per the repayment schedule, slow recoveries need to reschedule the repayment charts and no recover. The loan recoveries also need additional costs to manage and recover the loans that eventually increase the cost of banking operations. De Servigny and Renault (2004) also model the credit risks models by including the recovery rates. The slower recovery rates may be the potential issue for the rural and other commercial banks exposed to the financial instability. Castro and Garcia (2014) find the derived estimates from their model show that higher loss of the rural banks come from the slow recoveries and increase the probabilities issues to maintain their adequate capitals to sustain in the financial market.

The farmers need loans for the different purposes including growing the crops. The efficient use of the loans to grow the crops has the significance impact on the repayment of loans. So, the farmers' intentions are unknown related to the utilization of agricultural loans. Olagunju and Ajiboye (2010) conduct surveyed to find the lending decisions for the agricultural lending in Nigeria by applying the Tobit regression. They find that Nigerian banks are facing the problems of slow credit recovery rates from the agricultural side and patronage from the government despite of an increase in NPLs from the agricultural sector. The slow recovery rates are due to the poor recovery management system. The non-recovery loans from the sector may increase the banks viability for the long-term prospectus. The Nigerian banking system need to well hand the agricultural loans to avoid the financial distress.

The farmers have different ways to obtain the loans for the agricultural objectives: formal and informal. The formal channels are the banking and other financial institutions are the key players to advance the agricultural loans. The informal channels include the family and friends financial support to their relative farmers to grow the crops. So, the recovery of the loans for both channels may be significantly different. As our study focuses on the loan's recoveries and financial stability, so depends on the secondary data sources rather than the primary surveyed data. Therefore, our study mainly focuses on the formal channel of banks to agricultural credit. Rajeev and Deb (1998) investigate the role of institution and non-institutions to lending the agricultural in West Bengal, India. They find that there are a higher recovery rates for the informal credit than the formal credit.

So, the recoveries of the loans from the agricultural sector have the potential growth of the agricultural development programs. An effective recovery system can reduce the non-performing loans, increase the profitability, improve the liquidity and sufficient to make the capital to meet the capital requirements. The interest variable of the paper is the expected recoveries from the agricultural loans by incorporating the climate sensitivity impacts on the farmers income-based o the

agricultural productivity. The objective is to see the impact of the loan recoveries on the financial stability of the Pakistani banks.

Along with the interest variable, agricultural loan recoveries, the study also chooses other control variables based on the intensive literature review to estimate the model. The key controls variables are return on assets, equities-to liabilities, non-performing loans, and retain earning to total assets. The different empirical studies prefer to use these control variables to model the financial stability models. Some of the key empirical studies include Al Salamat and Al-Kharouf (2021), Abusharba et al. (2013), (Nguyen, 2021) and Nugroho et al. (2021).

Al Salamat and Al-Kharouf (2021) investigate the determinants of FS for the Jordan's financial system over the period of 2007-2016 by applying the random effect panel regression. They prefer CAR, NPL and numbers of returns checks denied by the banks due to liquidity problems proxies variables of FS. They choose ROA, ROE, inflation, EPS, GDP growth, total liabilities to assets ratios as the model variables to examine the FS of Jordan's banking system. They find that ROE and GDP growth positively impact the CAR, means that higher banking system profitability and economic growth improve the CAR of the banks. The other determinants inflation, total liabilities to assets and EPS negatively impact the CAR, means that these determinants reduce the capital to meet the emergency financial requirement and cause to instable the financial stability. But they find the reverse results with the other proxy of FS, NPL. They find that ROE, EPS and GDP growth rate negatively impact the NPLs. The lower earnings due to the increase in the NPLs, slow economic activities increase the NPLs and reduce EPS also due to an increase in the NPLs. The other determinants inflation and liabilities to assets positively impact the NPLs.

Abusharba et al. (2013) seek the determinants of CAR to test the FS of the Islamic banks in Indonesia over the period of 2009-2011. They choose the ROA, NPL, deposit structures, liquidity, and operational efficiency among the key factors to study the FS. They find that profitability and liquidity positively impact the CAR whereas NPL negatively impacts the CAR. The other determinants depositor structures and operational efficiency do not have the significant impacts on CAR of the Indonesian Islamic Banks.

CAR measures the financial health of the banks and indicates the banks have adequate owned capital to observe the financial stress (Gunadi et al., 2013), also indicates the level of the risks associated with banks (Nguyen, 2021). Nugroho et al., (2021) test the FS of Indonesian Banks over the period of 2015-2019 by applying the pooled, FE and RE regressions. They find that NPLs, CAR, ROA, and net interest margin significantly impact the financial stress index. They find that NPL and CAR positively impact the financial stress index whereas ROA and net interest margin negatively impact the financial stability index.

Nguyen (2021) investigates the impacts of micro variables on the CAR of Vietnamese banking sector over the 2010-2020 by applying the GMM regression. He prefers to use profitability ratios: ROA and ROE, loans to asset, deposit to assets, NPLs to investigate their impacts on the FS. He finds that high CAR has the more buffers to observe the shocks and enhance the FS of Vietnamese banks. Further, he finds that profitability has negative impacts on the FS due to the meeting the regulation requirement to increase the equities more proportionally to the profits. He finds that NPLs negatively impact the CAR.

Roncoroni et al. (2021) investigate the induced climate policy impacts on market conditions and recovery rates of the assets by applying the stress tests for the Mexican banks. Their empirics applying the risk assessment forward approach for the low carbon transition economy. They find that stronger market conditions in the disorder low carbon transition policies are more ambitious and increase the financial risks. Similarly, Caselli (2022) also find climate change has impacts on the cooperative banks. They have a significant role to provide the finance to meet the low carbon transition economy objectives.

The moral hazard hypothesis and too big to fail theory address the relationship of capitalization with the NPLs and FS. The moral hazard theory proposed by Berger and DeYoung (1997), the theory hypothesizes an inverse relation of capitalization and risky borrowing. The banks with low capitalization enter to more risky business borrowing. On the other side, too big to fail theory suggest that highly capitalized banks deals in the high risky borrowing and other related activities as they expect the protection from the government.

The profitability or efficiency theory argues that banks with lower profitability due to the bad management more likely to invest in risky projects and borrowings that may cause to increase the NPLs and instability of financial sector (Berger and DeYoung, 1997). Shaw et al., (2013) developed dynamic equilibrium model to investigate the implications of CAR. They find that CAR is the one of the critical factors to regulate the banking sector to avoid the financial instability. They find that banks have the options to accumulate their equities over the periods to respond to the CAR rather than to cut back their lending powers. They observe that monetary policy also impacts the way of channel to respond the CAR.

The soundness of the financial institutions pays attention to their earnings as their assets are increasing than their earnings that may be the cause of the financial instability. The other group of the financial institutions should pay attention to their liabilities as the growth in the liabilities is higher than the growth of the equities that may be another factor to instable the financial institutions. Braima (2021) investigates the CAMEL regulatory framework for the GCC Islamic banks under the banks' micro and macro factors. They find that equity to assets and liabilities to assets (debt ratio) ratios positively impact the Z-score, ROA and ROE also positively impact the Z-scores. Profitability has different impacts on the financial stability of banks. Some studies that find the positive relationship of profitability with CAR includes Raouf and Ahmed (2020), Amendola et al., (2021), and Boulanouar et al. (2021), whereas the other studies that find the negative association of NPs on CAR are Raouf and Ahmed (2020), Boulanouar et al. (2021), and Daoud and Kammoun (2020).

Financial stability of the financial institution is one of important pillar of financial sector. Wanger (2007) found that increased liquidity reduces financial stability. Chang et al, (2008) observed that focused banking system has significant impact on non-performing loans and improving financial stability. Maya Finger and Ilanit Gavious (2017) observed that large projects can have adverse effect on the environment. Dafermos et al. (2018) analyzed the effects of climatic change on financial stability of firms and banks.

The study expects that climate changes destroy the capital and reduce profitability and deteriorate the liquidity of firms which in turn raises the rate of defaults. Climate induced financial instability also negatively affect credit expansion, reduce the loan recoveries and also effect economic activity negatively. The above-mentioned facts necessitate the testing of below give hypothesis.

H1: Agriculture loan recoveries significantly improve the financial soundness of lending institutions in short-run, and long-run.

3 Data and Methodology

We tested our hypothesized relationships in a panel sample of eighty-two districts of Pakistan over a period of 21 years i.e., 2000-2020. the cross-sectional observations are greater than the time series observations, so we expect that the variations in the cross-sectional data dominate the variations in the time series data. We have the total recovery as a regressed variable. The regressor variables of betas of the climate change index of model 1 and dummy to capture the positive and negative impacts of the climate change on the agriculture production are our main concerns. Moreover, we have the other consolidated variables of the financial institutions as independent variables including the spread of interest rate, return on assets, size of loans, and deposit to assets ratios as control variables.

$$FS_t = f(\text{Loan recoveries}_t + ROA_t + Eq_liab_t + NPR_t + RE_assets_t) \quad (1)$$

$$FSt = \beta_0 + \beta_1 \text{Loan recoveries}_t + \beta_2 ROA_t + \beta_3 Eq_liab_t + \beta_4 NPL_t + \beta_5 RE_assets_t + \varepsilon_{it} \quad (2)$$

Where t = timeframe;

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

It is necessary to check the integration order of each variable first and then the ranking of integration through the unit root Test. Stationary data could give unbiased results (Haseeb et al., 2018). Therefore, it is imprative to check unit root problems related to the model variables. The study applies Augmented Dickey-Fuller (ADF) test in this regard. In addition, the study also prefer to apply different diagnostic tests to check the reliability and validity of the model results. Based on the stainoalrity tests, we find that our model variables integrated at I(0) and I(1), so, teh simple OLS regression is not appriporate for our empiric. Therefore, we prefer to use the Autoregressive Distributed-lag (ARDL) that addresses the issues of stantionarity of model variables at I(0) and I (1). To test the vailidity and reliability of results, we apply the ARDL bound test to check the co-integrations among the model vriaibles.

$$FSt = \beta_0 + \beta_1 \text{Loan recoveries}_t + \beta_2 ROA_t + \beta_3 Eq_liab_t + \beta_4 NPL_t + \beta_5 RE_assets_t + \varepsilon_{it} \quad (2)$$

Mathematical form of study ARDL model is as given:

$$CAR_t = \beta_0 + \theta_0 CAR_{t-1} + \theta_1 \text{Loan recoveries}_{t-1} + \theta_2 ROA_{t-1} + \theta_3 Eq_liab_{t-1} +$$

$$\theta_4 NPL_{t-1} + \theta_5 RE_assets_{t-1} + \sum_{i=1}^a \beta_i \Delta CAR_{t-i} + \sum_{i=0}^b \gamma_i \Delta \text{Loan recoveries}_{t-1} +$$

$$\sum_{i=0}^c \delta_i \Delta ROA_{t-i} + \sum_{i=0}^d \lambda_i \Delta Eq_liab_{t-i} + \sum_{i=0}^e \vartheta_i \Delta NPL_{t-i} + \sum_{i=0}^f \psi_i \Delta RE_assets_{t-i} + \nu_t \quad (3)$$

Where: Δ indicates the first difference operators,

β_0 is the slope-intercept,

ε_t represents error terms.

The extended strands of the influence variables are as follows:

$$\theta_0 CAR_{t-1} + \theta_1 \text{Loan recoveries}_{t-1} + \theta_2 ROA_{t-1} + \theta_3 Eq_liab_{t-1} + \theta_4 NPL_{t-1} + \theta_5 RE_assets_{t-1} +$$

$$\sum_{i=1}^a \beta_i \Delta CAR_{t-i} + \sum_{i=0}^b \gamma_i \Delta \text{Loan recoveries}_{t-1} + \sum_{i=0}^c \delta_i \Delta ROA_{t-i} + \sum_{i=0}^d \lambda_i \Delta Eq_liab_{t-i} +$$

$$\sum_{i=0}^e \vartheta_i \Delta NPL_{t-i} + \sum_{i=0}^f \psi_i \Delta RE_assets_{t-i} \quad (4)$$

Where CAR_t presents financial stability at year t

Loan recoveries present the average predicted recovery of agricultural loans at year t derived from model specified in 3.1.1.2

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

RE_assets present the retained earnings to assets ratio of banks at year t

4 Results and Discussions

The following table 1 presents the descriptive statistics of model 3. The proxy variable of FS is capital adequacy ratio has the average value of 13.63 by following the minimum value of 8.50 and maximum value of 18.56. The main variable of predicted observations of loan recoveries based on the PCSE regression has the average value of 6.35 with having minimum value of 6.27 and maximum value of 6.41. The profitability ratio of banks has average profitability of 1.76 with a range of 0.50 to 3.07. Leverage proxy equity to liabilities has average value of 0.09 with minimum value of 0.07 and maximum value of 0.10. The non-performing loans are 0.12 on averages with a range of 0.07 and 0.24. The final model variable retains earning to total assets ratio has the mean value of 0.01 by following the maximum 0.03 and minimum with 0.001.

Table 1
Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Capital adequacy ratio	21	13.63	3.13	8.50	18.56
Natural log of 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
Nonperforming 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

a. Unit root test

The following table 2 presents the stationarity test of Augmented Ducky Fuller (ADF). The study finds that proxy variables of FS, predicted loan recoveries and equity to liabilities are significant at I(1) whereas proxy variables of profitability, nonperforming loans and retained earnings to assets ratios are significant at I(0). It is concluded that ARDL model is appropriate to test the impact of loan recoveries on the FS in the presence of control variables including profitability, NPLs, equity to liabilities and retained earnings to assets.

Table 2
Stationarity Test

Variables	Level	1st difference
Capital adequacy ratio	-2.447	-3.48*
Natural log of predicted variable of loan recoveries	-1.993	-6.674*
Return on Assets	-3.683**	-4.284**
Nonperforming loan ratio	-3.666***	-2.032**
Equity to liabilities	-1.589	-4.482***
Retain earning to assets ratio	-3.518*	-4.18**

b. Correlation Matrix

The following table 3 presents the Pearson pair wise correlations among the model variables. The magnitude of the coefficients is varying between the range of 0.779 between the FS and retained earnings to assets ratio and 0.037 between the profitability and equity to liabilities ratio. Therefore, the study concludes that there may be no multicollinearity issues among the variables as a pre-diagnostic test.

Table 3
Correlation Matrix

	Capital adequacy ratio	Predicted loan recoveries	Return on Assets	Equity to liabilities	Nonperforming loan ratio	Retain earning to assets ratio
Capital adequacy ratio	1					
predicted loan recoveries	0.7423	1				
Return on Assets	0.3241	0.3571	1			
Equity to liabilities	-0.6303	-0.6068	0.0369	1		
Nonperforming loan ratio	-0.5832	-0.6534	-0.5273	0.4161	1	
Retain earning to assets ratio	0.7786	0.7528	0.3001	-0.6531	-0.677	1

i. ARDL Regression

Pesaran/Shin/Smith (2001) ARDL Bounds Test

Table 4 presents the Pesaran (2001) bound tests of co-integration. F statistic of the Bond test (30.951) is greater than the upper bound values that show the presence of co-integration of financial stability proxy variable "CAR" with the vector of exogenous variables (expected agricultural loans recoveries, profitability, equity-liabilities, NPLs, RE- assets) in the long run. The study prefers to use Akaike information criterion (AIC) to select appropriate lag of the model variables. Based on AIC, the study finds the lags 1,1,1,1,0 for expected agricultural loans recoveries, profitability, equity-liabilities, NPLs, and RE- assets, respectively.

Table 4
ARDL Bounds Test of Co-integration

F Statistics	Significance level	The critical values for the bound test	
		Lower Bound	Upper Bound
30.951, K =5 (lag : 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

ii. Results of ARDL Regression

Table 5 presents the short-run and long-run association of the model variables. The agricultural loan recoveries and eq-liabilities negatively impact the FS of Pakistani banks in the short run. The banks need a separate framework to recover the agricultural loans from the farmers. The banks bear additional costs in the forms of legal procedure, hiring of special staff to supervise and monitor the recovery process that offset and may have net benefits in negative, which indirectly impact on FS in short run. The other possible reason may be that the slow process of loan recoveries has negative impacts on FS for the short periods and may have positive impacts for the longer periods. De Servigny and Renault (2004) find that slower recovery rates adversely impact on the rural and other commercial banks that may increase the operation costs of the banks in future.

Profitability and NPLs positively impact the FS in the short run. In Pakistan, the major agricultural loans are granted to the farmers under the different governmental agricultural development programs that may have the loose regulatory framework but the potential guarantee from the government of Pakistan in case of defaulting of agricultural loans. The declarations to waive off agricultural loans from government for the affective rural regions due to the natural disasters in the form of heavy rains and flood, the repayment of such waive off loans from the government help the banks to sustain their stability in short run.

Whereas, in the long-run, NPLs significantly negatively impact the FS, ROA is insignificant and other model variables loan recoveries, RE-assets, and eq-liabilities positively impact the FS. The error correction (ECM (-1)) is negative and significant, means that the FS of banks comes from the loans recoveries in the disequilibrium is adjusted at the speed of 86% in the long run. R-squared value shows that 97% variations in the model regressand are explained from the model regressors. The F-statics of the model indicates that the model is fit for the model study.

Table 5
Long-run and Short-run Estimations

Dependent Variable agricultural loan recoveries, lag(1,1,1,1,0)							
<i>Long-run</i>				<i>Short run</i>			
Variable	Coefficient	T-Values	P-Values	Variable	Coefficient	T-Values	P-Values
Agricultural loan recoveries	76.01307	12.26	0.000***	Δagricultural loan recoveries	-60.53245	-6.37	0.000***
ROA	0.110498	0.55	0.598	ΔROA	1.694844	11.19	0.000***
Eq-liabilities	26.53179	2.04	0.076*	ΔEq-liabilities	-45.0848	-4.28	0.003***
NPLs	-9.08484	-2.89	0.020 **	ΔNPL	7.211959	2.15	0.064**
RE_assets	95.38744	2.94	0.019**	Constant	-407.6023	-5.87	0.000***
ECT(-1)	-0.8638	-8.06	0.000***				
R-square 0.9773, Adjusted R-square 0.9489							
*** indicates 1 %, ** indicates 5 % and * indicates 10% level of significance							

The key variable in our model loans recoveries has interesting association with the FS of the Pakistani Banks. In long run, it is positively impacted on the FS; means that Pakistani banks have the effective tools to recover the agricultural loans from the farmers. The tools may be re-scheduling of repayment of loan, extension of credit period upto very next sale of agricultural products and create a pressure from the other group members for the grant of group agricultural loans and like others. Whereas the slower of the loan recoveries higher the changes of the FS in short run. The lower the agricultural productivity due to the climate induce impacts reduce the farmers' income in short run and they are unable to repay the agricultural loans in times. The banks that are involved in the higher agricultural financing have face the issue of FS due to the liquidity issues. Our findings are similar with the findings of Allen, Whitley, and Winters (2022). They find that commodity banks respond to liquidity shocks come from the natural disaster including the loss of assets and crop damages. They maintain their liquidity by different tools including to access to the central banks. As in the case of Pakistan, agricultural credit is granted to the farmers under the umbrella of agricultural loan schemes of the State Bank of Pakistan. So, in short run, the non-performing agricultural loans adversely impacts the FS in short run and slower recovery rates are the potential issue for the financial stability of rural and commercial banks (De Servigny & Renault, 2004; Castro & Garcia, 2014) but with the effective policies in the long run, the loan recoveries improve the FS of Pakistani Banks by improving their liquidity.

The control variable of profitability positively impacts the FS in both long and short run. Al Salamat and Al-Kharouf (2021) find that returns on assets and equity positively improve FS. The higher loan recoveries reduce the bad debts and improve the banks' profitability. NPLs negatively impact the long run as an increase in the NPLs due to the lousy management actions increase the financial instability of banks (Nguyen, 2021; Raouf and Ahmed, 2020). Equity to liabilities negatively impacts FS in short run, means that Pakistani banks with lower capital are the potential risk for the financial instability. This finding is similar with Al Salamat and Al-Kharouf (2021). Retained earnings reserves accumulations over the periods reduce the financial instability but is a potential risk to instable the FS in short run.

Table 6 presents the results of diagnostic tests to check for the consistency of applied model. The tests of Breusch-Godfrey LM, Breusch-Pagan, ARCH, and Jarque-Bera indicate that there is no serious issue of serial correlation, heteroskedasticity and residuals are normally distributed.

Table 6
Diagnostic Tests

Tests	χ^2 (P value)	Result
Ramsey	0.9843	Model is specified correctly
Breusch-Pagan	0.1423	Absence of heteroscedasticity
ARCH	0.3524	Absence of heteroscedasticity
Jarque-Bera	.3522	Estimated residuals are normal

The study checks the stability of the model by testing the CUSUM and CUSUM of squares tests (Brown et al. 1975). CUSUM and CUSUM of square graphical tests as given in figure 4.1 indicate that the study model is stable and valid to test the impact of agricultural loan recoveries on the FS of Pakistani banks.

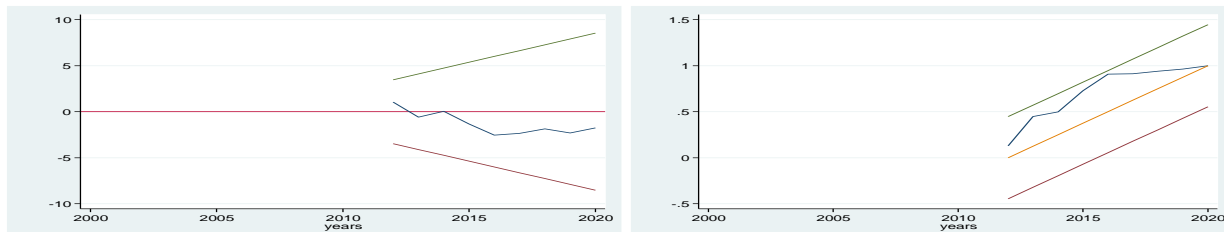


Figure 4.1 CUSUM and CUSUM of squares

5. Conclusion and Implications

The study finds that FS plays a significant role to the economic growth of Pakistan. The banking sector of Pakistan has the safety of margin to absorb the shock in the economy. The banking sector has been closely supervised and monitored to increase the public confidence and save their interests. The control variables have significant impact on economic growth and causal relationships in short and long run. The economic growth moves towards equilibrium but with more fluctuations in dampening ways. Inflation rate negatively impact the economic growth in long run whereas FDI, interest rate, employability has the positive impacts on economic growth.

This study has the implication for the policy makers and economists. The financial stability is the backbone tool for the smooth running of economy, so, the policy makers particularly in formulating the production regulation considers the effective role of capital adequacy and liquidity of the banking sectors to meet the requirements of the financial market. The increase in the employability for the longer time span rather short working hours and lowering the interest rate fuel the economic activities in Pakistan. So, it is imperative to the policy makers to work to create the new employment opportunities by providing the market need based educational and vocational skills.

REFERENCES

- Abusharba, M. T., Triyuwono, I., Ismail, M., & Rahman, A. F. (2013). Determinants of capital adequacy ratio (CAR) in Indonesian Islamic commercial banks. *Global review of accounting and finance*, 4(1), 159-170.
- Al Salamat, W., & Al-Kharouf, S. (2021). The Determinants of Financial Stability: Evidence from Jordan. *International Journal of Business and Social Science*, 12(1).
- Allen, K. D., Whitley, M. D., & Winters, D. B. (2022). Community bank liquidity: Natural disasters as a natural experiment. *Journal of Financial Stability*, 60, 101002. <https://doi.org/10.1016/j.jfs.2022.101002>
- Amendola, A., Barra, C., Boccia, M., & Papaccio, A. (2021). Market Structure and Financial Stability: the Interaction between Profit-Oriented and Mutual Cooperative Banks in Italy. *Journal of Financial Services Research*, 60(2-3), 235–259. <https://doi.org/10.1007/s10693-021-00360-1>
- Berger, A., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. *Journal of Banking and Finance*, 21, 849–870.
- Boulanouar, Z., Alqahtani, F., & Hamdi, B. (2021). Bank ownership, institutional quality and financial stability: evidence from the GCC region. *Pacific-Basin Finance Journal*, 66, 101510. <https://doi.org/10.1016/j.pacfin.2021.101510>
- Braima, B. H. G. E. (2021). Determinants of islamic banks distress in gulf council countries (GCC). In *Linear and Non-Linear Financial Econometrics-Theory and Practice*.
- Caselli, G. (2022). How Do Cooperative Banks Consider Climate Risk and Climate Change?. In *Contemporary Trends in European Cooperative Banking* (pp. 193-223). Palgrave Macmillan, Cham.
- Castro, C., & Garcia, K. (2014). Default risk in agricultural lending, the effects of commodity price volatility and climate. *Agricultural Finance Review*.
- Chang, E. J., Guerra, S. M., Lima, E. J. A., & Tabak, B. M. (2008). The stability–concentration relationship in the Brazilian banking system. *Journal of International Financial Markets, Institutions and Money*, 18(4), 388-397.
- Creel, J., Hubert, P., & Labondance, F. (2015). Financial stability and economic performance. *Economic Modelling*, 48, 25-40.
- Daoud, Y., & Kammoun, A. (2020). Financial Stability and Bank Capital: The Case of Islamic Banks. *International Journal of Economics and Financial Issues*, 10(5), 361.
- Dafermos, Y., Nikolaidi, M., & Galanis, G. (2018). Climate change, financial stability and monetary policy. *Ecological Economics*, 152, 219-234.
- De Servigny, A., & Renault, O. (2004). *Measuring and managing credit risk*. McGraw-Hill.
- Etukumoh, E. A., & Akpaeti, A. J. (2015). Analysis of loan default and repayment performance among farmers in Akwa Ibom State Integrated Farmers' Scheme. *Russian Journal of Agricultural and Socio-Economic Sciences*, 41(5), 30-39
- Finger, M., Gaviious, I., & Manos, R. (2018). Environmental risk management and financial performance in the banking industry: A cross-country comparison. *Journal of International Financial Markets, Institutions and Money*, 52, 240-261.
- Fredriksson, O., & Frykström, N. (2019). *Economic Commentary "Bad loans" and their effects on banks and financial stability*. Retrieved from

<https://www.riksbank.se/globalassets/media/rapporter/ekonomiska-kommentarer/engelska/2019/bad-loans-and-their-effects-on-banks-and-financial-stability.pdf>

- Gunadi, I., Anta, A., Cicilia, T., & Harun, A. (2013). *Penggunaan Indeks Stabilitas Sistem Keuangan (Issk) Dalam Pelaksanaan Surveilans Makroprudensial*. Retrieved from <http://publication-bi.org/repec/idn/wpaper/WP152013.pdf>
- Haseeb, M., Hassan, S., Azam, M., & Suryanto, T. (2018). The dynamics of governance, tourism and environmental degradation: the world evidence. *International Journal of Global Environmental Issues*, 17(4), 340-363.
- Nguyen, M. S. (2021). Capital adequacy ratio and a bank's financial stability in Vietnam. *Banks and Bank Systems*, 16(4), 61-71. doi:10.21511/bbs.16(4).2021.06
- Nugroho, A. W., Adam, M., Widiyanti, M., & Sulastri, S. (2021). Analysis of Financial Stability Determinants in Indonesia. *Journal of Sosial Science*, 2(2), 99-106.
- Olagunju, F., & Ajiboye, A. (2010). Agricultural lending decision: a tobit regression analysis. *African Journal of Food, Agriculture, Nutrition and Development*, 10(5). <https://doi.org/10.4314/ajfand.v10i5.57897>
- Okam, C. C. (1994). Approaches To the Teaching of Social Studies in GW Joof & H. C. Amadi. *Social Studies In Schools*. Onitsha: Outrite Publishers.
- Raouf, H., & Ahmed, H. (2020). Risk governance and financial stability: A comparative study of conventional and Islamic banks in the GCC. *Global Finance Journal*, 100599. <https://doi.org/10.1016/j.gfj.2020.100599>
- Rajeev, M., & Deb, S. (1998). Institutional and Non-Institutional Credit in Agriculture: Case Study of Hugli District of West Bengal. *Economic and Political Weekly*, 33(47/48), 2997-3002. Retrieved from https://www.jstor.org/stable/4407410#metadata_info_tab_contents
- Richards, C. E., Lupton, R. C., & Allwood, J. M. (2021). Re-framing the threat of global warming: an empirical causal loop diagram of climate change, food insecurity and societal collapse. *Climatic Change*, 164(3), 1-19.
- Roncoroni, A., Battiston, S., Escobar-Farfán, L. O., & Martinez-Jaramillo, S. (2021). Climate risk and financial stability in the network of banks and investment funds. *Journal of Financial Stability*, 54(3), 100870.
- Schinasi, M.G. (2004). *Defining Financial Stability (EPub)*(No. 4-187). International Monetary Fund.
- Shaw, M. F., Chang, J. J., & Chen, H. J. (2013). Capital adequacy and the bank lending channel: Macroeconomic implications. *Journal of Macroeconomics*, 36, 121-137.
- Udoh, E., & Egwaikhide, F. O. (2008). Exchange rate volatility, inflation uncertainty and foreign direct investment in Nigeria. *Botswana Journal of Economics*, 5(7), 14-31.
- Wagner, W. (2007). The liquidity of bank assets and banking stability. *Journal of Banking & Finance*, 31(1), 121-139.