

Impact of Efficiency on Sustainability of Banks: An Empirical Study of Pakistani Banks

Muhammad Sadiq Malik

Faculty of Economy and Business (FEB),
Universiti of Malaysia Sarawak (UNIMAS)

Sophee Sulong Bin Balia

Faculty of Economy and Business (FEB),
Universiti of Malaysia Sarawak (UNIMAS)

Rossazana Bt Ab Rahim

Faculty of Economy and Business (FEB),
Universiti of Malaysia Sarawak (UNIMAS)

Naveed Iqbal Chaudhry

University of the Punjab Gujranwala
Campus Gujranwala, Pakistan

Waqar Munir

Faculty of Economy and Business (FEB),
Universiti of Malaysia Sarawak (UNIMAS)

ABSTRACT

Purpose: The banking sector plays an essential for economy and mostly the economies of developing countries are associated with the banking sector performance. This research aims to empirically examine the impact of efficiency, technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE). on the sustainable performance of banks in Pakistan through. **Design/Methodology/Approach:** The research methodology used ideology of positivism by testing an old theory with new data to draw new conclusions and new results using quantitative methods. This study has a novelty because a huge set of data was collected. Secondary data from Five years was collected for Pakistani Banks on a time series basis and analyzed using E-Views v10 to test the study's hypothesis. **Findings:** The results suggest that efficiency significantly impacts the sustainable performance of banks. Pure technical efficiency has an insignificant impact on the sustainable performance of banks; in contrast, technical efficiency and scale efficiency impact on the sustainable banks of Pakistan. **Practical Implications:** This paper will assist banking sector management to focus on efficiency to achieve banks' sustainability. **Originality / Value:** During the research process, the literature review shows that prominent authors recommended the conduct of studies that measure the impact of efficiency on the sustainable performance of banks. This paper has a novelty in that the impact of efficiency,

technical efficiency, pure technical efficiency, and scale efficiency has also been measured on the sustainable performance of banks in one holistic unison study.

Keywords: Banks sustainable performance, efficiency, Technical Efficiency, Pure Technical Efficiency, Scale Efficiency, Data Envelopment Analysis.

INTRODUCTION

The banking sector plays an essential role in the contemporary economy, and the economies of developing countries are associated with the banking sector performance (Hussain, 1999; Zaidi, 2005; Ali, 2012; Janoundi, 2014; & Duygun, Shaban, Sickles). An efficient and reliable banking system requires accomplishing three important goals: significant profit, high-quality customer service, and the availability of adequate funds for lending to borrowers (Homaidi et al., 2018). The latest literature suggests that banking sector performance-related studies mostly focus on American and European countries, and there is less focus on developing countries and emerging economies of Asia (Yu, 2017). The performance of banking sector-related research is very low, having a wide degree of dispersion, and the performance of banks is not yet a well-defined area of knowledge (Abreu et al., 2019). The prominent researchers of modern times believe in conducting more innovative research on the performance of the banking sector, particularly in developing countries (Duygun et al., 2015; Brooks & Schopohl, 2018; Yu, 2017; Abreu et al., 2019). The knowledge of banks' performance is not complete, and apart from banks' efficiency, other variables may also be explored that can supplement bank efficiency, resulting in overall bank performance (Abreu et al., 2019).

Sustainable banks are well-reputed, give confidence to investors and customers, and attract customers; that is why these banks increase their profitability (Bussoli et al., 2019). A unison study will be conducted to measure and combine the impact of efficiency, technical efficiency, pure technical efficiency, and scale efficiency on the sustainable performance of banks. The government and senior management of Pakistani banks can take safeguards as demanded by the Financial Action Task Force (FATF) to avoid blocklisting in light of the recommendations of measuring the sustainable performance of banks to curb fake accounts, money laundering, risks, and misappropriations.

The study focuses on the sustainable banking sector performance in Pakistan, a developing country. Pakistan is emerging as a big economy due to the peace accord in Afghanistan on February 29, 2020, and CPEC dividends. Presently 33 banks are operating in Pakistan. This study will include five years of data from all banks in Pakistan from 2016 to 2020. The banking sector will be divided into public banks (owned by the government), private (commercial) banks, and foreign banks operating in Pakistan.

This research will focus on four dependent variables such as banks' efficiency, technical efficiency, pure technical efficiency, and scale efficiency, whereas the sustainable performance of banks is the dependent variable. Banks performance framework (BPF) created in this study will add to the knowledge of the banking sector literature. This research benefits policymakers, management, and investors of Pakistan to assess the sustainable performance of banks in Pakistan, and the same performance variables can be utilized by banking sector management in other countries. Moreover, the investors and customers' confidence will enhance in the banking sector due to the sustainable performance of banks. This study will be helpful to the

investors in making investment decisions for investment in different banks. The sustainable banking sectors will also boost other sectors of Pakistan like education, health, industry, construction sector, and tourism, resulting in society's overall well-being.

Research Objectives

- To investigate the impact of Efficiency impact on sustainable performance
- To investigate the impact of technical efficiency on the sustainable performance of Pakistani banks;
- To examine the impact of pure technical efficiency on the sustainable performance of Pakistani banks;
- To analyze the impact of scale efficiency on the sustainable performance of Pakistani banks.

LITERATURE REVIEW

Efficiency and Sustainable Performance

The bank management efficiency has a moderate relationship with the sustainability of Irani banks (Sadjadi, 2022). According to Pampurini and Quaranta (2018), the efficiency level, characterized by a financial intermediary and bank production process, is strongly interrelated with sustainable performance. The sustainability concept is interlinked with efficiency because both are dependent on the managers' strategic choices. Profit and cost efficiency are considered the most vital components of sustainability (Pampurini & Quaranta, 2018). The sustainability social practices in society, such as labor and financial contribution to the projects of the local community and partnership development, will reduce the risk of firms (Ciliberti et al., 2011).

The organization's efficiency contributes to efficient employees, good customer service, cost reduction, and improvement in performance, resulting in sustainability (Marie et al., 2015). The sustainability concept is strongly associated with efficiency, and both can influence each other because both depend on strategic choice (Pampurini & Quaranta, 2018). Sustainability is dependent efficiency and organization of an economic system (Scholtens & van't Klooster, 2019). A corporation with steady, sustainable performance through social, environmental, and financial performance attains reduced litigation, reduction in cost, and better operational efficiency (Malsha et al., 2020).

The efficiency of firms increases by implementing sustainability practices in decision-making and business strategy resulting in overall corporate value and shareholder assets (Portillo-Tarragona et al., 2018). There is a strong relationship between the sustainable performance of banks and efficiency (Cornett et al., 2016). If a bank emphasizes environmental investments, it may lose efficiency, affecting the bank's sustainable performance (Nidumolu et al., 2009). The bank's efficiency is a measure utilized for the organization of the sector, and this measure is established to attain the sustainable performance of banks (San-Jose, Retolaza, & Lamarque, 2018).

The efficiency for sustainable performance comprises two inputs, deposits and equity, which assist in controlling funds associated with corporate performance (McGuire, Sundgren, & Schneeweis, 2017). Based on the above literature review of prior studies following hypotheses have been derived by the researcher;

- H1: Efficiency has a significant impact on sustainable performance.

Technical Efficiency and Sustainable Performance

There is a trade-off among economic, social, and environmentally sustainable performance (Ait Sidhoum et al., 2022). This study used technical efficiency as a proxy for economically sustainable performance, which determined a relationship between technical efficiency and sustainable performance. Alem (2021) used a stochastic approach and evaluated the role of technical efficiency as the environmental variable in achieving sustainable performance. Higher technical efficiency enhances sustainable performance, and there is a need to increase technical efficiency to improve sustainable performance (Hepelwa, 2013). Based on the literature review of previous studies, the following hypothesis has been derived by the researcher;

- H2: Technical efficiency has a significant impact on sustainable performance.

Pure Technical Efficiency and Sustainable Performance

Dia et al. (2020) analyzed the efficiencies relationship with the sustainable performance of the six largest banks in Canada for the period from 2000 to 2007. The study suggested best practices for pure technical efficiency to improve the Canadian banking sector. Based on the relationship established by prior studies, the following hypothesis has been derived by the researcher;

- H3: Pure Technical Efficiency has a significant impact on sustainable performance.

Scale Efficiency and Sustainable Performance

Xue et al. (2021) used panel data from 2011 to 2018 to evaluate the sustainable performance and green innovation efficiency of eight Chinese economic areas by categorizing these economic areas into scale efficiency and pure technical efficiency. A relationship exists between green innovation efficiency (sustainable performance), technical efficiency, and scale efficiency (Xu & Zhou, 2021). An organization enhances sustainable development by improving scale efficiency, resulting in 46 sustainable performances (Ma et al., 2021). Based on the above literature review of prior studies, the following hypothesis has been derived by the researcher;

- H4: Scale Efficiency have a significant impact on sustainable performance

METHODOLOGY

The research aims to produce a research project by turning research objectives and questions into a research project considering research choices, strategies, and time horizons (M. Saunders et al., 2007). The research design is a course of action that guides the researcher during the collection, analysis, and interpretation of observations (Nachmias & Nachmias, 1996). The research design can be classified into three types keeping in view the research purpose: exploratory, descriptive, and explanatory (Churchill, 1995; M. Saunders et al., 2007). According to M. Saunders et al. (2007), exploratory research is useful if a researcher desires to precisely understand a problem when not aware of the problem's nature. The three principal exploratory research methods are literature research, expert interviews, and group-focused interviews (M. Saunders et al., 2007).

The descriptive design is related to an occurrence relationship or an incidence between the variables, and it takes place when researchers desire to describe some of the characteristics of a phenomenon (Sekaran & Bougie, 2010). The present research investigates and tries to establish the relationship between the sustainable performance of Pakistani banks and

efficiency. The unit of analysis is the main entity of individuals or groups a researcher analyses in the research study-the present research analyses banks and the banking sector. The unit of analysis for current research is the banking sector of Pakistan. The banks' data has been collected; the target for analysis is the banks, and the beneficiary is the banks. However, at the micro-level, the management will also be benefited, but the research is not purely from the management point of view. Sampling has a vital role in quantitative research. An adequate number of units of analysis must be used for statistical analysis (M. Saunders et al., 2007).

The present study's research population consists of all Pakistani banks, including public and private (domestic and foreign) banks. The platform assisted the researcher including all Pakistani banks, the state bank of Pakistan, and World Bank websites. The population of interest is easily found on these websites. 33 Banks listed with the State Bank of Pakistan have been analyzed. The period of data is from 2016 to 2020. These banks are considered to make high generalizability of findings.

Data Analysis Techniques

To analyze the collected data, the researcher used the EViews v10. In today's researcher's world, this software is prominent and mostly used in secondary data analysis. Researchers used different types of tests to complete the study purpose. First, the researcher applied the descriptive test to get the data's description. Finally, OLS panel method was used to test the study hypotheses, the OLS panel both penal methods used, i.e., the fixed-effect model and random-effect model, and the conclusion was taken based on the housemen test for the selection between appropriate models. Moreover, some diagnostic tests were also applied to ensure the data suitability.

Econometric Model

The following main equation has been calculated to find the bank's efficiency and most suitable determinants in Pakistani Banks based on OLS, Random, and Fixed Effect Model.

$$SP_{it} = \alpha + \beta_1 Eff_{it} + \beta_2 TE_{it} + \beta_3 PTE_{it} + \beta_4 SE_{it} + \varepsilon_{it}$$

Whereas SP is the dependent variable, demonstrating the sustainable performance, while i is the observations, and t is the time. On the right-hand side, α is the constant, and β is denoted as the coefficient of the variables. Moreover, in the whole econometric model B_1 is the efficiency, B_2 is the technical efficiency, β_3 is pure technical efficiency, and B_4 demonstrated scale efficiency, and lastly, ε is the error term.

Measurement

The following table presents the final measurement proxies for the variables used in the current study.

Table 1: Measurement Proxies for the Variables

Variables	Dimensions	Proxies
Sustainable Performance	Financial Performance Environmental Performance	Financial performance is measured as Return on Asset, while social and environmental performance is measured as dummy variables, if the firm is doing coded 1 or if not coded 0.

	Social Performance	
Efficiency	Technical Efficiency (TE). Pure Technical Efficiency (PTE). Scale Efficiency (SE).	Based on the DEA method by selecting fixed assets, Deposits & Short-term funding, and equity as inputs, while Net income Securities and loans are outputs.

RESULTS AND DISCUSSION

Results and Analysis

Descriptive Analysis:

Descriptive statistics involve descriptive coefficients summarizing a data set representing the entire population or a specific sample related to a population (Lawless & Heymann, 2010). Table 4.1 of the descriptive analysis below represents the mean values of the data, median values, maximum and minimum values, and standard deviation. Furthermore, the table also represents the values of skewness, the value of kurtosis, and the total number of observations.

Table 0.1: Descriptive Analysis

Item	SP	EFFI	TE	PTE	SE
Mean	17.263	0.676	0.365	9.297	35.816
Median	14.595	0.672	0.324	5.862	34.666
Maximum	43.878	1.174	0.865	31.888	42.801
Minimum	8.711	0.200	0.170	1.094	29.782
Std. Dev.	6.074	0.205	0.147	8.995	5.367
Skewness	2.394	0.057	0.552	0.435	0.178
Kurtosis	10.659	2.845	2.865	3.687	1.297
Jarque-Bera	44.45115	9.112100	55.28486	19.91318	4.519828
Probability	0.000000	0.010503	0.000000	0.000047	0.104359
Sum	11.36923	-2.217065	-71.09286	20605.54	433.8529
Sum Sq. Dev.	0.062226	0.009560	19.12129	86836.74	0.034079
Observations	160	160	160	160	160

The outcomes present positive results for the normality of data, whereas the total observations 160. According to the values presented in the above table, the mean values for the variable's sustainable performance, Efficiency, Technical efficiency, pro-technical efficiency and scale efficiency are between the maximum and minimum values. This table shows that no value for these variables is significantly high or significantly low, representing that all values lie between the maximum and minimum value range, so there are no outliers or extreme values in the data. Furthermore, the values for standard deviation and skewness represent that no value in the data is abnormal, and the data is entirely normal except for sustainability, and it is because of index measurement.

Unit Root Test:

The unit root test informs of the integration order of the variables, and also informs if stochastic trends and it informs whether the data is stationary or not and appropriateness and suitability of the data. Another application of the unit root test is to evaluate whether the data exhibits signs of serial correlation since the presence of unit root in the data leads to spurious regressions (Gujarati, 2022). The stationarity of the variables was estimated via the LLC or the

Levin Lin Chu test (Alam et al., 2021). LLC is among the most commonly used tests for panel data as it combines the advantages of the group-specific and individual tests like the ADF and Fisher tests Table 4.2. It is evident that all variables were integrated at both level $I(0)$ and $I(1)$, and also that stationarity issues weren't present in the data as all variables show that unit root wasn't present in the data.

Table 4.2: Unit root Test

	I (0)	I (1)
SP	-4.67***	-34.1011**
EFFICIENCY	-7.08859***	-29.9125***
TE	1.69086	-428.196***
PTE	5.86984	-12.2907***
SE	-6.99701**	-1290.35***

Cross-Sectional Dependence Test:

The next test prior to application of the regression analysis was the cross-sectional dependency test. Due to the fact that the banks operate in the same country, and under the governance of similar conditions and regulations, the values for one could influence the values of the other banks (cross-sectional dependence), which is a common problem observed in panel data and can lead to inaccurate results (Pesaran, 2015; Pesaran, 2021). Another reason for occurrence of cross-sectionality can be the effect of unobserved factors on the variables (Bailey et al., 2016; Pesaran, 2007). Thus, the cross-sectional dependence test was conducted, and findings in table 4.3 indicate three tests i.e., the Breusch-Pagan LM test, Pesaran scaled LM test, and Pesaran CD test. As the tests indicate that the null hypothesis of the test i.e., cross-sectional dependence isn't present in the model, was accepted since $p < 0.00$. Thus, it was concluded that the variables didn't exhibit any signs of cross-sectional dependence.

Table 4.3: Cross-Sectional Dependence

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	948.2548	496	0.0000
Pesaran scaled LM	13.34310		0.0000
Pesaran CD	-1.124380		0.2609

Cointegration Test:

Once the stationarity and cross-sectional dependence has been negated, the next step in the preliminary testing process is of the cointegration analysis. The cointegration analysis is performed for two reasons: to establish cointegrating relationships among the variables and also to evaluate the presence of long-run associations among the variables. The Kao and Pedroni cointegration test were used for the evaluation, and it can be seen that the test results were significant. Thus, the variables were found to be cointegrating as well and there will be a significant association between the predictors and sustainable bank performance.

Table 4.4: Cointegration Analysis

	t-Statistic	Prob.
ADF	-7.106182	0.0000
Residual variance	8.98E-06	
HAC variance	7.50E-06	

Correlation Analysis:

A correlation test or analysis is a method of statistical analysis applied to analyze the strength of the relationship between two continuous and numerically measured variables (Bolboaca & Jäntschi, 2006). Correlation can be positive or negative; a positive correlation can be observed when the increase in one variable causes a simultaneous positive increase in the other variable. In contrast, a negative correlation can be observed when the increase in one variable causes a decrease in the other variable. According to the above, the correlation between sustainability and itself is significant, and the strongest as the value is +1, the correlation between sustainability and efficiency, technical efficiency, and scale efficiency is significant as well, and the correlation is strong and positive with except pro-technical efficiency with significant as well negative.

Table 0.5: Correlation Analysis

Variable	SP	EFFI	TE	PTE	SE
SP	1				
EFFICIENCY	0.156 <i>0.000</i>	1			
TE	0.609 <i>0.000</i>	0.091 <i>0.000</i>	1		
PTE	-0.214 <i>0.000</i>	-0.126 <i>0.000</i>	0.179 <i>0.000</i>	1	
SE	0.070 <i>0.000</i>	0.011 <i>0.000</i>	-0.144 <i>0.000</i>	-0.012 <i>0.000</i>	1

Normality:

Figure 4.1 represents the quantiles of normal distribution for sustainability, Efficiency, Technical efficiency, pro-technical efficiency and scale efficiency. This represents the analysis regarding whether or not a specific set of data plausibly comes from some specific theoretical distribution like exponential or normal (Jones, 1994). In case both of the sets of the quantiles come from similar distribution, the researcher becomes able to represent points forming an almost straight line. Also, there is no absence of outliers in the data, whereas if a plot involves skewed normal probability, the collected data is not distributed normally. This figure 4.1 represents that the data is normally distributed for sustainability. Furthermore, assessing the plot for Efficiency, Technical efficiency, pro-technical efficiency and scale efficiency, it can be observed that almost all values lie close to the diagonal line, which means that all values are closed. No value is extremely high or low, representing the normality of the data and the normal distribution of the values collected against the variables.

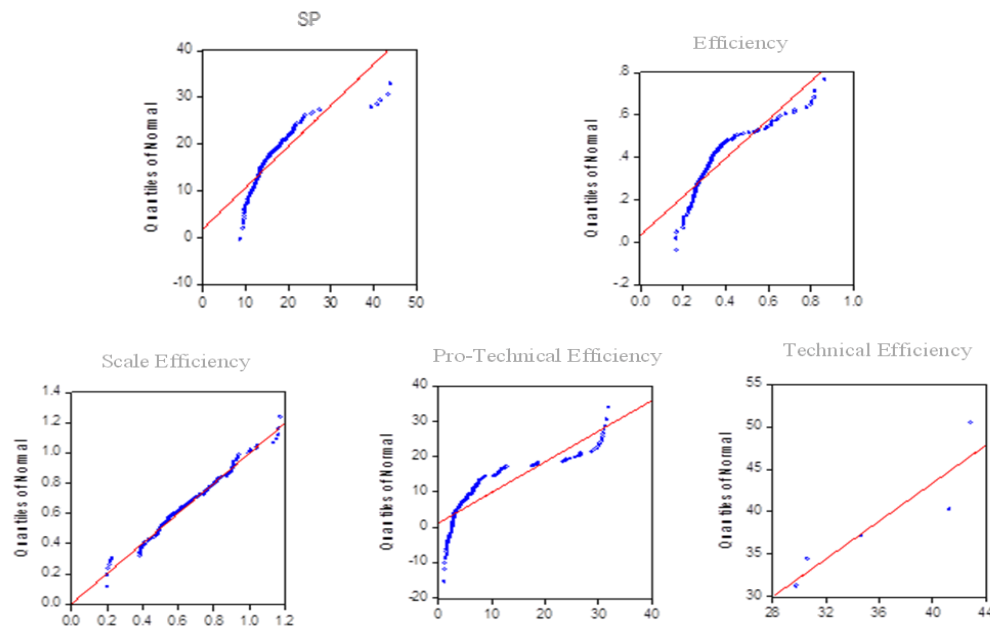


Figure 0.1: Quantiles of Normal

Regression Analysis:

The least-squares method is a statistical analysis and procedure applied for finding the best fit for a specific set of data points, with the minimization of the sum of the residuals or the offsets of the points from the curve plotted (Aish & Jöreskog, 1990). R squared represents a statistical value or measure that elaborates the proportion of the variance related to a dependent variable explained with the help of the independent variable or the other variables present in the regression model. Therefore, this value for the first model is equal to 70%, whereas the adjusted R-squared represents a similar thing, with a 69% value (see Table 4.3). Furthermore, the coefficient value represents a specific variable's level of impact; in this case, the dependent variable taken is sustainability. The results above represent the fact that the impact of efficiency on sustainability is significant as the value of probability is less than 0.05 and the beta value is .79, which means that efficiency has a positive and significant impact on banks' sustainability by increasing 1 unit of efficiency banks can gain 79% positive impact on sustainability. Furthermore, it has been found that the impact of technical efficiency and scale efficiency has a significant positive effect on sustainability, having a p-value lower than 0.05, while pure technical efficiency has no significant effect on sustainability. The p-value is greater than 0.05. The researcher simultaneously applied the cross-sectional random effect model to make the results more generalizable.

Table 0.6: Regression Analysis (OLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.6605100	80.20954	2.724178	0.0472
EFFICIENCY	0.4493318	1.338813	3.580273	0.0005
TE	0.102230	1.926254	12.66823	0.0001
PTE	0.7707344	0.031955	0.229831	0.8185
SE	0.346121	0.063183	5.478105	0.0000
Weighted Statistics				

R-squared	0.700609	Mean dependent var	16.26267
Adjusted R-squared	0.691065	S.D. dependent var	6.073944
F-statistic	45.45891	Durbin-Watson stat	2.221254
Prob(F-statistic)	0.000000	<i>Dependent Variable: SP</i> Method: Panel Least Squares	

Cross-Section Random Effects Model:

The next findings are based on the cross-section random effects model Table 4.4 finding indicates that efficiency has an insignificant impact on bank sustainability. In contrast, technical efficiency has a positive and significant impact on Pakistani bank's sustainability, and the coefficient value against this relationship is 14, which means that if we increase one unit of profitability will lead 14% positive impact on sustainability as the probability value is less than 0.05 same as the scale efficiency has 0.18% positive and significant impact on sustainability. In contrast, the impact of pure technical efficiency on bank sustainability through the random effect model is insignificant effect. Weighted statistics in random effect show that R square is 69.9% while the adjusted R square value is .683, and the whole model is significantly based on F stats and probability value, which are 43.84 and 0.000, respectively.

Table 0.7: Regression Analysis (RE)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	202.7313	29.91164	6.777673	0.0000
EFFICIENCY	1.370052	1.313400	1.043134	0.2986
TE	14.21135	1.536253	9.250657	0.0000
PTE	0.163409	0.065590	2.491381	0.0138
SE	0.185985	0.022583	8.235467	0.0000
Weighted Statistics				
R-squared	0.699039	Mean dependent var		2.053641
Adjusted R-squared	0.683094	S.D. dependent var		1.985841
F-statistic	43.84074	Durbin-Watson stat		1.066707
Prob(F-statistic)	0.000000	Dependent Variable: SP Method: Panel EGLS (Cross-section random effects)		

Fixed-Effect Model:

The next findings are based on the fixed-effect model. The findings of the fixed-effect model indicated that efficiency has a significant impact because the probability value is less than .05. In contrast, technical efficiency (TE) has an insignificant effect, while pure technical efficiency (PTE) and scale efficiency (SE) positive and significantly impact bank sustainability in Pakistan. Moreover, overall model showing that all variables have a .98 impact on the sustainability world model is significant because if a state is 161.55 and the probability value is .000 (see Table 4.5).

Table 0.8: Regression Analysis (FE)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	92.52906	34.24435	2.702024	0.0079
EFFICIENCY	0.501767	1.455163	0.344819	0.0000
TE	9.787445	1.685389	5.807231	0.7308

PTE	1.796782	0.247101	7.271451	0.0000
SE	0.116270	0.024381	4.768814	0.0000
Weighted Statistics				
R-squared	0.981310	Mean dependent var	16.26267	
Adjusted R-squared	0.975236	S.D. dependent var	6.073944	
F-statistic	161.5523	Durbin-Watson stat	1.293103	
Prob (F-statistic)	0.000000	Dependent Variable: SP	Method: Panel Least Squares Fixed	

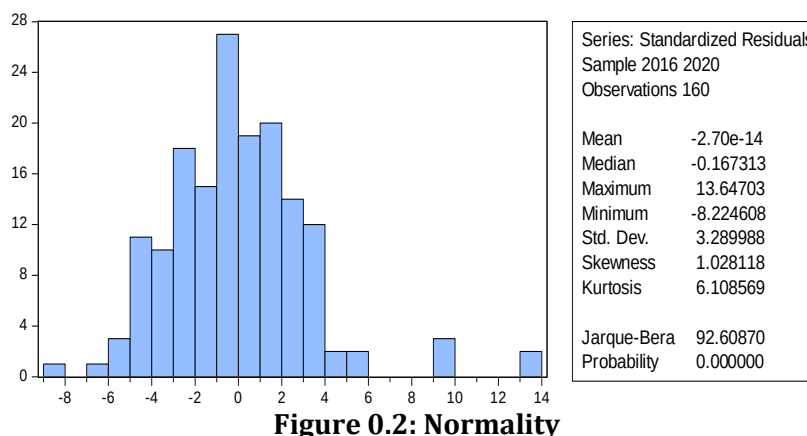
Multicollinearity:

In ordinary least square regression, multicollinearity is a common issue. Multicollinearity generally occurs when one or two predictors in a single model have high correlations. Therefore, researchers used a VIF to confirm the issue of multicollinearity in the data. Table 4.6 shows the result, and it can be seen that VIF values for all variables lie in the threshold range; most researchers suggest this value is less than 10.

Table 0.9: Variance Inflation Factors

Variable	Coefficient	Uncentred	Centred
	Variance	VIF	VIF
SP	1.792422	12.56442	1.053019
EFFICIENCY	3.710455	8.075197	1.125265
TE	0.001021	2.391488	1.152638
PTE	0.003992	73.49133	1.604079
SE	10.66147	33928.36	7.253249
C	6433.571	90315.70	NA

Descriptive statistics in the chapter's initial part show each variable's individual normality. The following diagram shows the overall formality of the final model of this study. Figure 4.2 also represents the normality of the data; the bell-shaped graph represents the distribution of the data, and the least level of fluctuations represents that the data is distributed in a completely perfect bell-shaped trend and does not fluctuate significantly or with low values as well. The value of Jarque-Bera is significant, indicating that this study's overall model is abnormal. However, the researcher applies the cross-sectional dependency model to confirm the residual shocks of the cross-sections.



Cross-Section Dependence:

Table 4.7 presents the cross-section dependence test; there are three different tests. When n is greater than t, then cross-sectional dependence was measured based on Pesaran CD, and the results indicated a cross-sectional dependence correlation between the residuals. Therefore, the null hypothesis is rejected. If remedy n is greater than t, then generalized least square can be applied, but when the t is less than n, weighted cross-sectional can be run based on the ordinary least square method. Therefore, based on the diagnostic results, the researcher applies the OLS and fixed-effect model.

Table 0.10: Cross-section Dependence (Correlation)

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	831.2948	496	0.0000
Pesaran scaled LM	10.64562		0.0000
Pesaran CD	8.528854		0.0000

Regression Analysis (PEGLS - CS):

Table 4.8 illustrates the OLS model based on Panel EGLS (Cross-section weights). The results of Panel EGLS (Cross-section weights) indicated that all major variable efficiency, TE, PTE, and SE significantly impact a bank's sustainability. At the same time, it is observed in the previous model that efficiency has an insignificant impact.

Table 0.11: Regression Analysis (PEGLS - CS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	212.8362	24.09806	8.832088	0.0000
EFFICIENCY	00.062213	0.434042	7.055103	0.0000
TE	00.43787	1.479066	15.17029	0.0773
PTE	0.032416	0.011881	2.728358	0.0071
SE	0.209560	0.025388	8.254424	0.0000
Weighted Statistics				
R-squared	0.877613	Mean dependent var		30.51899
Adjusted R-squared	0.871129	S.D. dependent var		23.05256
S.E. of regression	2.952532	Sum squared resid		1316.334
F-statistic	135.3493	Durbin-Watson stat		0.486925
Prob(F-statistic)	0.000000	Dependent Variable: SP Method: Panel EGLS (Cross-section weights)		

Panel EGLS (Cross-section weights):

In the same way, as the researcher applied the Panel EGLS (Cross-section weights) with the fixed-effect model, the findings changed, as illustrated in Table 4.9. the results indicate the Panel EGLS (Cross-section weights) based on the fixed-effect model. Our hypotheses are proven, and all the regressors positively and significantly impact bank sustainability. The overall model shows the good indices as the Adjusted R square is .98, which is efficient and good. The Durbin-Watson value near 1.63, which is near 2, indicates no autocorrelation problem among the variables, as illustrated in Table 4.9.

Table 4.9: The Panel EGLS (Cross-section weights)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	97.40688	18.82171	5.175241	0.0000
EFFICIENCY	1.257223	0.610658	2.058800	0.0417
TE	6.733883	1.023749	6.577669	0.0000
PTE	1.495381	0.129372	11.55877	0.0000
SE	0.077187	0.011816	6.532285	0.0000
Weighted Statistics				
R-squared	0.990730	Mean dependent var		25.04753
Adjusted R-squared	0.987718	S.D. dependent var		14.71032
S.E. of regression	0.864655	Sum squared resid		89.71546
F-statistic	328.8593	Durbin-Watson stat		1.639670
Prob(F-statistic)	0.000000	Dependent Variable: SP Method: Panel EGLS (Cross-section weights)		

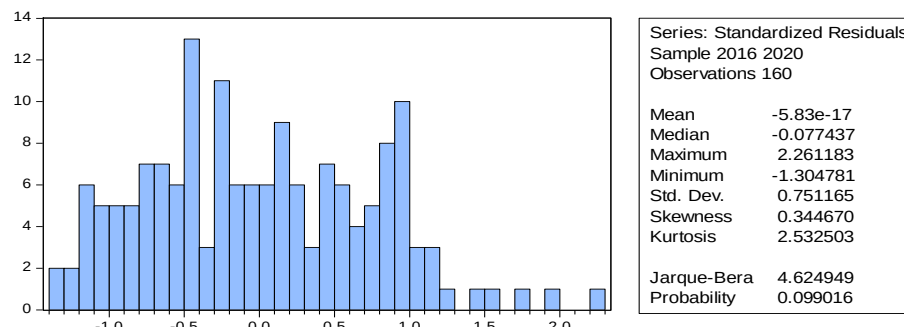
Cross-Section Dependence Tests:

Moreover, the revised analysis of the cross-section dependence test also solved the correlation problem in weighted residuals. As the value of Pesaran CD is greater than .05, the null hypothesis can be rejected, and there is no issue of cross-sectional dependence.

Table 0.12: Cross-Section Dependence Tests

Test	Statistics	d.f.	Prob.
Breusch-Pagan LM	776.0018	496	0.0000
Pesaran scaled LM	8.890066		0.0000
Bias-corrected scaled LM	4.890066		0.0000
Pesaran CD	1.279150		0.2008

Finally, the revised normality test, as illustrated in Figure 4.3, demonstrated that the overall model now is well and normal as we can draw a bell-shaped curve, which leads to normality. Moreover, Jarque-Bera is 4.62, and the probability value is 0.099, greater than .05; therefore, the overall model is now normal in all aspects.

**Figure 0.3: Model Normality**

Results Discussion

Impact of Efficiency on Banks' Sustainability:

The study's first hypothesis indicates that efficiency positively impacts sustainable performance, and the current study findings confirm this hypothesis. Findings indicate that efficiency ($\beta = 0.062213$, $p = 0.000$) has a 6.2% positive impact on banks' sustainability as the β value is 0.062 and the p -value is 0.00. Hence, it is proved that the first hypothesis of this study is accepted, and these results are also related to the study's first objective. These results are similar to the results of Pampurini and Quaranta (2018). The efficiency level, characterized as a financial intermediary and bank production process, is strongly interrelated with sustainable performance (Pampurini & Quaranta, 2018). The firm efficiency increases sustainability (Portillo-Tarragona et al., 2018). There is a strong relationship between efficiency and the sustainable performance of banks (Cornett et al., 2016). The bank's efficiency is a measure to attain sustainable performance of banks (San-Jose et al., 2018). In contrast, Nidumolu et al. (2009) state that if a bank emphasizes environmental investments, it may lose efficiency, affecting its sustainable performance (Nidumolu et al., 2009).

Technical Efficiency and Banks' Sustainability:

The sub-hypothesis under efficiency H2 demonstrated that technical efficiency significantly impacts the banks' sustainable performance. Researchers, based on empirical findings, concluded that technical efficiency has no significant impact on banks' sustainability as results are ($\beta = -.443787$, $p > .05$). Therefore, H2 of the current study is rejected. The same dissimilarity was found in the study of Alem (2021), who used a stochastic approach and evaluated the role of technical efficiency as the environmental variable to achieve sustainable performance. A significant relationship exists between technical efficiency and sustainable performance.

Pure Technical Efficiency and Banks' Sustainability:

Pure technical efficiency has a significant impact on sustainable performance in Pakistani banks, and this statement is relevant to H3. Based on the researcher's hypothesis testing, and it is proved based on the fixed effect model, PTE has ($b = .0324161$ and $p < .005$) a significant positive impact on banks' sustainability.

Findings are coherent with the previous studies that were reviewed in the literature that have similar results. Shah et al. (2019) analyzed the relationship between PTE and sustainable banks using data envelopment analysis (DEA) and assessed the relationship between non-sustainable banks and pure technical efficiency. Pure technical efficiency significantly influences sustainable banks, whereas PTE has an insignificant impact on non-sustainable banks (Shah et al., 2019).

Scale Efficiency and Banks' Sustainability:

Scale Efficiency (SE) is the third factor used in the current study to measure the efficiency in the banking sector, and H4 proposed that scale efficiency significantly influences banks' sustainability. The outcome of the result indicated that scale efficiency has a significant impact on banks' sustainability in Pakistan ($b = 0.209560$, $p\text{-value} = 0.000$).

The previous studies reviewed in the literature have dissimilar results. A significant relationship exists between SE and sustainable performance (Pereira & Marques, 2022).

Likewise, Li, Tsang, and Lee (2021) state that an organization enhances sustainable development by improving scale efficiency, resulting in sustainable performance (Li et al., 2021).

Table 4.12 presents the hypotheses summary;

Table 0.13: Hypotheses Status

H. No#	Statement	p-value	Status
H1	Efficiency has a significant impact on sustainable performance.	0.062213 (0.000)	Supported
H2	Technical efficiency has a significant impact on sustainable performance	0.437870 (0.0773)	Not Supported
H3	Pure Technical efficiency has a significant impact on sustainable performance.	0.032416 (0.0007)	Supported
H4	Scale efficiency has a significant impact on sustainable performance	0.209560 (0.0000)	Supported

Research Implications

This research contributes to the body of knowledge in many domains and will assist in constructing future research models and objectives both in Pakistan and other countries. The main implications of this research in the theory and practice are discussed and designed to address the current issue of sustainability in the banking sector in general and particularly in Pakistan. The impact of efficiency has been studied to measure the sustainable performance of banks. Sustainable studies related to the banking sector are scarce in the finance literature, and these are mostly ignored in the banking sector studies, especially in developing countries. This study will lay the foundation for the researchers to conduct more sustainability studies in the finance and banking sectors. This research benefits policymakers, management, and investors of Pakistan to assess the sustainable performance of banks in Pakistan, and the same performance variables can be utilized by banking sector management in other countries.

Limitations and Further Suggestions

Banks' sustainability studies have gained focus in developed countries, and studies are scarce in developing countries. Therefore, the focus of this study remained on the Pakistani banking sector, which is among the developing and emerging economies. Although under the guidance of the state bank of Pakistan, all banks are moving toward digitization, the massive database is still not available in Pakistan. The future researcher can increase the database and may analyze data from 10 to 20 years in the context of Pakistan. The future researcher can expand the scope of research by conducting studies of the banking sector on various continents or regional comparative studies of developed countries with developing countries. Future researchers may resort to interviews with banking sector experts and other stakeholders to compare the results of secondary data. Techniques like ARDL or the VAR model will give better results for visibility of the short-term and long-term impact of variables on sustainability.

CONCLUSION

The researcher collects yearly data from 32 banks in Pakistan from the year 2016 to 2020. Banks' efficiency is measured in terms of technical efficiency, pure technical efficiency, and scale efficiency. The researcher applies the OLS, fixed effect, and random effect models to

achieve the study objective. Findings indicate that Efficiency significantly impacts bank sustainability in Pakistan. The study's first hypothesis indicates that efficiency positively impacts sustainable performance. The second hypothesis demonstrated that technical efficiency insignificantly impacts the banks' sustainable performance. Researchers, based on empirical findings, concluded that technical efficiency has no significant impact on banks' sustainability. Therefore, H2 of the current study is rejected. Pure technical efficiency has a significant impact on sustainable performance in Pakistani banks, and H4 proposed that scale efficiency significantly influences banks' sustainability. Date testing in the current study indicated that scale efficiency has a significant impact on banks' sustainability in Pakistan. This study achieved all three objectives formulated in the literature review. The study provided evidence of the significant relationship between technical efficiency and sustainable performance, pure technical efficiency and sustainable performance, and scale efficiency and sustainable performance. The sustainable performance of banks can be achieved by enhancing efficiency. This research has novelty and presents the impact of efficiency on the sustainable performance of banks. This thesis contributes to the existing literature on finance and economics and the banking sector. This study provides a new dimension for future researchers to replicate this study in other countries and regions. Comparative studies can also be conducted between regions. The latest techniques can be used, and new variables can be added to achieve more holistic results.

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