Cost Efficiency of Nepal's Commercial Banks Since and Its Determinates

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Abstract

Despite the clear importance of efficiency analysis in banking, this field has been overlooked in literature on the economy of Nepal, specifically in using Data Envelopment Analysis (DEA). This study uses DEA techniques to evaluate the efficiency of Nepali commercial banks in the publication's eight previous fiscal years, employs a Tobit analysis with novel regressors to evaluate determinants of efficiency, and provides some modest policy recommendations. This study found a highly significant relationship between bank size and efficiency, running directly counter to previous DEA literature on Nepal. Furthermore, this study found no significant relationship between banks that are the result of mergers and inefficiency.

1. Introduction

The study of cost efficiency in banking is critical to economic health and national development. Influential 20th century economist Joseph Schumpeter is quoted as saying "the banker…authorizes the people in the name of society…to innovate" (Demirgüç-Kunt 2010). This provides evidence to the premise that banks are highly important for development. Further developing this argument, Anne Krueger, Chief Economist at the World Bank during the 1980s, stated during a speech in India that "the more efficient credit allocation is, the more likely it is that credit goes to where it will deliver the best return" (Krueger 2004). The function of banks delivering credit to where it will deliver the best return, is improved by efficiency. By synthesizing these statements, we arrive at the argument that banks are highly important for a developing economy, and efficiency is highly important for banks.

Efficiency measures how well firms convert input into output. This study's proxy for measuring this efficiency is known as cost efficiency, measured as the potential cost of producing a good divided by the actual cost of producing it (Khan and Haque 2025). To illustrate this principle, a café that produces a cup of coffee for $1.00 but, with the same inputs, could have produced it for $0.80 has a cost efficiency of 0.8. The importance of efficiency in banking is evident in the advantages enjoyed by efficient banks. In a Data Envelopment Analysis on Pakistani banks, Ullah et al. argued that "a bank's Efficiency can lead to better customer service, return to depositors, fewer non-performing loans, and better economic growth and development" (2023). Furthermore, the fact that the strength of the banking industry is indispensable to the health of any economy, whether undeveloped or developed, is evident (Kreuger 2004). These citations reflect the reality that the cost efficiency of banks is of serious concern to any economy.

There are three objectives to this study: to use DEA to evaluate the efficiency level of commercial banks in Nepal over the last eight years, to analyze the determinates of cost efficiency by employing a Tobit regression, and to provide modest policy considerations.

DEA is a relatively novel method in economics research, and only two studies have employed it to study Nepali bank efficiency. Furthermore, the most recent study to do so was published in 2013, thirteen years before our study was conducted (Thagunna and Poudel 2013). In the period between 2013 and now, the ratio of private sector credit to GDP has increased nearly twofold from 50.5% to 90.5% (World Bank, n.d.). Clearly, the commercial banking landscape in Nepal has seen significant changes since the findings of this most recent study.

2. Data & Methodology

This study is concerned only with the twenty Nepali commercial banks that are currently operating and their historical data from annual reports going back to FY2074/75. Because of merges and other changes in the commercial sector over that time, some of these selected banks will not have data for the entire study period. Therefore, the data for our study is an unbalanced panel, which was deemed preferable to excluding banks that do not appear every year to present a less biased view of the industry. To determine inclusion criteria, this study refers to the operation date given in the National Rastra Bank's "List of Banks and Financial Institutions." While this bank sometimes indicates a merger and not the establishment of a bank, premerger data for all involved banks were not readily available for this study. This study is based entirely on (secondary) data acquired from commercial banks' unaudited financial statements.

Data Envelopment Analysis (DEA) is a method used to evaluate relative efficiency of different decision-making units (DMU). In this study, our DMUs are commercial banks. By considering the number of inputs relative to outputs for respective DMUs, DEA is able to construct an efficiency frontier for a given industry. Because DEA creates this frontier based on the most efficient DMU in a given industry, it is an inherently relative analysis and not objective. Each observation is given a score between 0 and 1 depending on its proximity to the efficiency frontier.

Our approach is a pooled DEA, where all 128 observations over eight years are treated as a single industry. As DEA analyzes the efficiency of firms relative to other firms in the same industry, this pooled method allows us to compare efficiency of banks through time and changes in efficiency. It must be noted, however, that this approach requires the assumption that the commercial banking industry is essentially the same across the years. The most intuitive potential consequence of this assumption not being fulfilled is that the efficiency of banks in earlier years is underestimated as they are compared to observations in future years with more experience and better technology. However, this study did not find this issue in the results.

In our inclusion of input and output variables, we rely on Gajurel (2010), which conducted a similar analysis of commercial banks in Nepal over fifteen years ago. To represent inputs, we consider three things: total deposits, personnel expenses, and property & other assets. These values are all taken directly from respective figures in annual reports. For the outputs, we likewise include total loans & advances (sum of loans & advances to customers and loans & advances to B/FIs) and total financial investments. Data is also collected on the total assets of each bank-observation for the Tobit regression, also found on the annual reports.

To evaluate the determinates of efficiency, we employ an econometric model known as Tobit regression. This method differs from a standard OLS model in that it censors the dependent variable such that no value higher than 1 or less than 0 will be determined, which is necessary given the nature of cost efficiency. For this model, we employ four independent variables: the ratio of personnel cost to total assets, the log of total assets, bank age, and a dummy variable representing whether a bank is the product of a merger. These variables are not borrowed from previous literature but reflect the literature practice of selecting variables that pertain to bank cost structure, scale, age, and organizational structure, respectively.

Before conducting the DEA, it must be noted that the descriptive statistics showed a subtle decrease in Fixed & Other Expenses between FY 2075/76 BS and FY 2079/80 BS while all other variables increased over all years. Additionally, a correlation matrix of the inputs and outputs revealed significant, positive correlations between all outputs and inputs. This result satisfies the necessary assumption that all inputs are correlated positively with outputs, we can proceed with our DEA.

Correlation Matrix: Inputs and Outputs

	(1)				
	dep	employee	fixed	loansadvances	financial
dep	1				
employee	0.870***	1			
fixed	0.631***	0.612***	1		
loansadvances	0.966***	0.858***	0.537***	1	
financial	0.910***	0.805***	0.635***	0.831***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3. Empirical Analysis

In analyzing the results of the DEA, a clear trend becomes visible. From the beginning of our study period, FY 2074/75 BS, to FY 2078/79 BS, the average efficiency of all commercial banks decreases from 0.861 to 0.727. Afterwards, efficiency increases to 0.904 by the end of our study period in FY 2081/82 BS. This "slump" is surprising and runs counter to the fear that efficiency in earlier periods would be underestimated. While this study does not test the causes of this slump with causality, there are notable macroeconomic trends occurring during this period. Firstly, in the years immediately preceding my study period, the National Rastra Bank implemented a paid-up capital policy incentivizing the merging of commercial banks (Shrestha 2015). Midway through the slump, the various effects of the COVID pandemic took its toll on the economy. For commercial banks in Nepal, the pandemic was a time of excess liquidity and aggressive lending. In the wake of the pandemic, proximate the nadir of the slump, Nepali banks were faced with a liquidity crunch as they no longer had the cash on hand to back their numerous loans (New Spotlight Nepal 2022). Finally, as the industry's efficiency begins to rebound, contractionary monetary policy in FY 2079/80 BS help alleviate inflation pressures and bring stability back to the Nepali economy (Nepal Rastra Bank 2024). While this study does not claim these events are necessarily tied to the efficiency of commercial banks at this time, they represent compelling parallels.

DEA Efficiency Scores by Fiscal Year

	(1)				
	mean	sd	min	max	p50
2074/75	0.861	0.131	0.679	1.000	0.824
2075/76	0.818	0.145	0.640	1.000	0.742
2076/77	0.796	0.087	0.618	0.969	0.806
2077/78	0.767	0.136	0.569	1.000	0.759
2078/79	0.727	0.130	0.548	1.000	0.693
2079/80	0.795	0.156	0.556	1.000	0.794
2080/81	0.819	0.149	0.520	1.000	0.862
2081/82	0.904	0.122	0.615	1.000	0.954
Total	0.814	0.141	0.520	1.000	0.823
N	128				

The twenty banks were also shown to have a range of efficiency levels. The least efficient banks over the 8-year period were Siddhartha Bank Ltd., Macchapuchhre Bank Ltd., and Prime Commercial Bank Ltd. with scores of 0.665, 0.696, and 0.699, respectively. Meanwhile, the most efficient banks were NIC Asia Bank Ltd., Nabil Bank Ltd., and Global IME Bank Ltd., with scores of 0.953, 0.962, and 0.965, respectively.

The Tobit regression findings were significant and unexpected. In our results, the most significant determinate of efficiency is bank size (log of total assets) with a p-value of 0.000. This is opposite the finding of Gajurel (2010) which found diseconomies of scale in Nepali banks during his period. If true, this finding represents a significant shift in Nepali bank competency. Furthermore, the ratio of personnel cost to assets was found to be significantly associated with efficiency with a p-value of 0.011. This finding is somewhat counterintuitive but can be explained by presuming that banks that pay higher salaries hire more effective workers. This study does not necessarily disprove the possibility of banks simply hiring more workers for the same wage. However that method seems less intuitively likely to be efficient. Bank age was also found to be somewhat significant with a p-value of 0.09, as banks gain more experience and expertise. Finally, the merged dummy was found to be insignificant, a surprising finding given the assumption that bank merging was partly responsible for the "slump" and the seemingly intuitive reasoning that merged banks face natural inefficiencies.

Following this *merged* finding, we decided to further investigate the relationship between this variable and efficiency. First, we created an interaction term variable between *merged* and the years of the slump to see if being merged significantly impacted whether a bank during that period was efficient. When this regression *merged x slump* to be inefficient, it was noted that 6 of the 9 total merged banks were not included in the unbalanced panel until the year after the slump ended, FY 2079/80. Seeing this result, a new interaction term was created between *merged* and *age* to see if newly merged banks were actually less efficient. This final regression showed that newly merged banks are not less efficient. Actually, merged banks were found to have a significantly higher efficiency at age = 0 but decrease efficiency significantly, with p-values of 0.024 and 0.017, respectively.

	(1)
theta	theta
cost_to_assets	17.963***
	(6.217)
ln_assets	0.111***
	(0.031)
bank_age_adj	0.002**
	(0.001)
merged	0.110**
	(0.048)
merged_x_age	-0.014**
	(0.006)
_cons	-2.329***
	(0.818)
var(e.theta)	0.018***
	(0.003)
Observations	128

Standard errors in parentheses

** p < 0.10, ** p < 0.05, *** p < 0.01*

Note: bank_age_adj is measured from merger date for merged banks.

4. Conclusion

While many notable observations can be deduced from this study, we cannot put forward any definitive claims to causality for analysis of efficiency scores and efficiency determinates. As for the DEA is non-parametric approach which lacks a functional form and

thus an error term, the efficacy scores themselves are accurate to the extent that our assumptions are accurate: i.e. that inputs all are positively and significantly correlated with outputs and that all DMUs operate in an essentially identical industry.

That said, the conclusions of this study are numerous and significant for the study of bank efficiency in Nepal. They are:

1. Average efficiency increased from 0.861 to 0.904 between 2074 and 2082.
2. From 2074 to 2078, average efficiency decreased, likely correlated with COVID-era economic disruptions and macroeconomic policy.
3. The banks with the highest average efficiency during the study period were NIC Asia Bank, Nabil Bank, and Global IME Bank.
4. The banks with the lowest average efficiency during the study period were Siddhartha Bank, Machhapurchhre Bank, and Prime Commercial Bank.
5. Efficiency increases significantly as the ratio of personnel expenses to total assets increases.
6. Efficiency also increases significantly as total assets increase (in opposition to previous findings in the literature) and slightly significantly with bank age.
7. A bank's efficiency is not significantly impacted by whether it was created via a merger.

5. Policy Recommendations

Because of their macroeconomic implications and lack of similar research, this study poses potential, if modest, policy recommendations for the National Rastra Bank, financial regulators in Nepal, a Nepali commercial bank leadership. While the viability of these policies depends largely on factors outside the scope of this study (for instance, market structure in #3), the available information generated by this study alone points to these recommendations. The three recommended courses of action are:

1. The National Rastra Bank should use efficiency findings to regularly evaluate industry average and individual bank cost efficiency. Cost efficiency is a critical aspect of the banking industry, so policies should be pursued to maximize it.
2. The priorities of both regulators and commercial bank leadership should reflect the findings that more cost-efficient banks pay more for employees per total asset value. Intuition implies prioritizing high salaries increases efficiency; however, this was not explicitly determined from this study.
3. Given the findings that larger banks tend to be more cost efficient and that the efficiency of merged banks is not significantly lower than others, continued commercial bank mergers may lead to increased cost efficiency.

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