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THE DETERMINANTS OF BANK DEPOSIT VARIABILITY: A DEVELOPING COUNTRY CASE

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THE DETERMINANTS OF BANK DEPOSIT VARIABILITY: A DEVELOPING COUNTRY CASE

Abstract

This paper reports on an analysis of deposit variability in the branch banking system of Bangladesh. As expected, deposit variability is greatest for small, rural branches. It declines with increases in branch size, the share of long-term fixed deposits, and number of types of deposits in a branch.

THE DETERMINANTS OF BANK DEPOSIT VARIABILITY: A DEVELOPING COUNTRY CASE

INTRODUCTION

Many lending institutions in developing countries have depended upon government or donor funds for expanding lending to priority sectors including agriculture. They are now being pressured, however, to rely less on these traditional sources of funds, and become more self-sufficient through deposit mobilization (Adams; Vogel). Little attention has been given to how this shift in source of funds may affect the institutions' operations, and the risks and costs of using deposits mobilized from the public. Although these costs and risks are a traditional concern of commercial banking, they represent a new challenge for public sector institutions, many of which were created in the past couple of decades in response to governmental desires to expand lending to agriculture, small businesses, and other priority clients.

No research has been found on the magnitude and nature of deposit variability in financial institutions in developing countries. This paper reports on an analysis of deposit variability in Bangladesh using a unique data set composed of almost 4,000 bank branches drawn from the largest banking institutions in the country. The next section provides some background information on Bangladesh banking and summarizes the results of past studies on deposit variability, all of which

relate to the U.S. The subsequent section describes a regression model used in the analysis, followed by a discussion of the empirical results and their implications.

BACKGROUND AND LITERATURE REVIEW

Bangladesh has followed a supply-leading approach to rural finance during the past fifteen years (Virmani). Interest rates have been set by the Central Bank, banks have been given lending quotas, terms and conditions have been specified for various types of loans, and large amounts of government and donor funds have been rediscounted through the central bank to lenders making loans for targeted purposes. For several years, banks were required to open two rural branches in exchange for a license to open a more desired urban branch. As a result, rural branches multiplied and agricultural lending grew.

The nationalized commercial banks have traditionally mobilized rural deposits and have channelled them into urban lending. On the other hand, the agricultural development bank has increased its market share of rural lending, but has relied heavily on central bank rediscounting for its funds. Recently, all lending institutions have been pressed to improve their performance by mobilizing more rural deposits and relying less on external funds for making rural loans. Little is known, however, about the variability in deposits and the problems banks will face in coping with such variability.

The basic problem for a bank is that it must be able to meet depositor demands for funds so it must anticipate fluctuations in its deposits and plan its cash

flow accordingly. The problem is accentuated in a developing country where poor communication and transportation facilities make it difficult to move money quickly between branches to meet unexpected demands. Furthermore, the seasonality of agricultural production may introduce great seasonality in supply and demand for funds. Yet holding excess liquidity to meet potential customer demands has a cost in reducing bank profits. Therefore, better information about the determinants of deposit variability could contribute to improved funds management.

Loanable bank funds are determined by that core of bank deposits that are fairly reliable. If deposit variability around this core is high, the proportion of loanable to total funds will be low and a bank will experience periods with surplus funds. Deposit variability can be viewed as having both a systematic and an unsystematic or random component. Systematic variation of a seasonal nature can be anticipated with a fair degree of accuracy by bank management. The unsystematic component cannot be anticipated and therefore has the most negative consequences for bank profits.

Current bank models simultaneously consider both the asset and liability sides of a bank's balance sheet in order to develop strategies for maximum profits. For developing countries with controlled interest rates and lending quotas and targets, however, the asset side of the bank offers less flexibility for management. Therefore, the efficient management of deposits represents an area in which improved management can contribute to bank profits.

The literature on bank deposit variability is almost exclusively limited to U.S. studies conducted during the 1960s and 1970s. The results of this research were far from conclusive, however. Several analysts felt that large banks would be more subject to deposit fluctuations than small banks, and consequently less able to anticipate reserve needs in the short run. Gramley found that the variability of both total and demand deposits were generally lower for large banks. Rangarajan also found an inverse relation between demand deposit variability and bank size. Fraser, however, was unable to find any systematic relationship. Dewald and Dreese found that large banks had less random deposit variability, while Kaufman found that large banks experienced relatively less deposit variability when measured bi-weekly or longer, but greater day-to-day variability.

Struble and Wilkerson found that interbank and government deposits had a relatively high degree of variation. The larger proportion of these accounts in larger banks tended to make their demand deposits more variable. Murphy concluded that the growth of demand deposits seemed to be associated with greater instability in demand deposits. Rangarjan showed that average variability for time deposits was twice as great as for demand deposits, but Fraser found the opposite result. Melnick found that U.S. government deposits are relatively unstable.

A few studies have looked at the effect of branching. Lauch and Murphy found that daily deposit balances in a six-office institution never displayed perfect correlation, and in some instances were either independent or negatively correlated.

Boltensperger suggested that a bank with a large number of depositors needed relatively less reserves because the relative variability of net cash flows decline with the number of customers.

Rangarajan argued that banks located in economically more diversified areas would experience less deposit variability, but his proxy variable of percentage of working force employed in manufacturing did not demonstrate the expected result.

Based on these sketchy results, it was expected that branch level deposit variability in Bangladesh would be lowest for urban branches, for larger branches, for larger sized average accounts, and for fixed versus other types of deposits. It was also expected that banks with smaller, more rural branches would experience greater deposit variability.

MODEL AND DATA

A simple linear regression model was specified to test the determinants of deposit variability using data routinely reported to the Bangladesh central bank by all bank branches. The model was specified as:

$$V_i = B_0 + B_1X_1 + B_2X_2 + \ldots + B_nX_n$$

Where: V_i = variability of deposits in each branch,

X_1 = branch size in total taka of deposits,[1]

X_2 = average size of deposit account,

[1] The Bangladesh currency is the taka and 25 taka were approximately equal to U.S. $1.00 during the period covered by this study.

X_3 = share of government deposits in total branch deposits,

X_4 = share of fixed deposits of 3 to less than 6 months term,

X_5 = share of fixed deposits of 6 to less than 12 months term,

X_6 = share of fixed deposits of 12 to less than 24 months term,

X_7 = share of fixed deposits of 24 to less than 36 months term,

X_8 = share of fixed deposits of more than 36 months,

X_9 = share of call deposits,

X_{10} = share of demand deposits,

X_{11} = share of savings deposits with checking,

X_{12} = share of savings deposits without checking,

X_{13} = dummy variable for branch location (urban = 1),

X_{14} = percent of population in the agricultural labor force, and

X_{15} = number of different types of deposit accounts in the branch.

The variability of bank deposits was measured using the coefficient of variation after ascertaining through the Dubin-Watson statistic that there is no significant autocorrelation in the data (Kaufman).

A unique data set was available for the study. It consisted of bank branch reports submitted to the Bangladesh central bank for eight reporting quarters for the years 1985 and 1986. The data covered all reporting branches of four nationalized commercial banks - Agrani, Janata, Rupali, and Sonali - and the agricultural development bank (Bangladesh Krishi Bank). These banks make most of the rural

loans made in the country and mobilize most of the rural deposits. They are also the largest banks in the country so they are responsible for a large share of the country's urban banking operations. After cleaning, data were available for 3,711 branches for these five banks of which 2,574 were rural[2] and the rest urban. As expected, about two-thirds of the rural branches fell into the lower half of branch size distribution compared to only ten percent of the urban branches (Table 1). Since it is a specialized agricultural bank, about 90 percent of the BKB branches fell into the very small or small rural category. The other banks had 60-70 percent of their branches in rural areas, but a larger proportion of their branches fell into the larger size categories. The average size of branch ranged from less than 2,000 taka in deposits (reflecting the dependence on external funds) to over 2.5 million taka.

RESULTS AND IMPLICATIONS

There were substantial differences among the bank branches in the deposit variability indexes calculated for the eight quarter period. The index for urban branches ranged from 0.027 to 1.68. For rural branches the range was even wider from 0.024 to 2.43. Therefore the relative variability of deposits in some rural branches was 100 times greater than others. The difference in mean levels between 0.180 for urban branches and 0.199 for rural branches was statistically significant. There were also significant differences in the variability index between several of the

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[2] Rural branches are defined as those located outside of municipalities or metropolitan areas.

banks and branch size categories.

The parameter estimates and corresponding t ratios for the regression model are presented in Table 2. Although the model is significant, there is a large amount of unexplained deposit variability. Most of the variables in the model are statistically significant.[3] The results show that deposit variability declines as branch size increases, as the share of fixed deposits 12 months and longer increases, and as the number of types of deposits held in the branch increases. Variability is also lower for urban branches, and somewhat surprisingly decreases as the agricultural labor force increases. On the other hand, deposit variability increases with an increase in the share of government deposits, call deposits, time deposits, and fixed deposits of less than 6 months. This is a logical result since, unlike most other categories of deposits, these deposits can be withdrawn fairly easily with little or no prior notice to the bank.

Many bank branches do not hold government deposits so a second model was tested for the 1,578 branches without such deposits. The R^2 almost doubled to 0.15 for this model, and the signs on all parameters continued unchanged except for fixed deposits 6-12 months.

Deposit seasonality was analyzed through a simple regression model using dummy variables to represent the four quarters of the year. There was a significant general seasonal pattern for rural branches with the fourth quarter being the peak

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[3] Variable X_{12} was deleted due to multicolinearity.

period, but no systematic seasonality was found in urban branches. There are some differences among regions in their pattern of deposit variability during the year. Therefore there may be some possibility, if seasonal patterns could be predicted by region, to transfer funds from surplus to deficit rural branches. That is only a limited possibility, however, as shown in Table 3 where surpluses and deficits correspond to quarterly deviations (positive and negative, respectively) from the trend line. All banks suffer net deficits in the first quarter because rural branches with deficits swamp the branches with surpluses during that quarter. On the other hand, all banks experience large surpluses during the fourth quarter. It is only during quarters two and three that there is a certain balance between surplus and deficit branches. This result implies that rural branches in general must hold large liquid surpluses to meet the demand for funds that arises especially in the first quarter, and/or have efficient intrabank mechanisms to transfer funds to and from urban branches.

The research reported in this paper revealed large variability in bank deposits in Bangladesh. The variability is greatest in rural branches where some branches experienced 100 times the variability of others. Deposit variability of this magnitude has serious implications for a country with severe constraints in its ability to transfer funds due to poor transportation and communication services, and frequent floods which interrupt the services that do exist.

The model used succeeded in identifying several determinants of variability. For example, longer term deposits contribute to reduced variability while government

and other types of call, time, and short term fixed deposits increase variability. Thus bank managers can reduce variability if they are successful in altering their mix of deposits. Furthermore, larger branches experience less variability than small ones so the growth of the economy generally and banking specifically will contribute to reduced deposit variability.

The research problem, however, is that the data available did not permit the specification of a more complete model. Undoubtedly there are several factors such as the specific nature of the local economy and the management practices of individual banks and branches that influence deposit variability in individual branches. Studies which specifically collect primary and secondary data on these variabiles would help identify their importance. Another study to be conducted is one that would also look at loan demand. The seasonality of loan demand may partially offset the seasonality of deposits supply in which case the current results overstate the deposit variability problem.

The general implication of these results is that the challenge given to banks in developing countries to reduce their reliance on external funds carries with it important implications for bank management. The literature to date has largely attempted to refute the frequent assumption that rural people cannot save, so deposit mobilization is unrealistic. This research suggests that a better understanding of deposit variability is needed if branches are to successfully cope with the variability inherent in these deposits.

Table 1. Distribution of Branches by Branch Size

Category	Number of Branches	Size[a] Very Small	Small	Medium	Large	Total
		(Percent)				
Rural	2,574	36	32	24	8	100
Urban	1,137	2	8	27	63	100
Total	3,711	25	25	25	25	100

[a] Size categories represent the division of branches into quartiles based on the mean level of deposits for eight quarters.

Table 3. Interbranch Funds Transfer Potential in Rural Branches

Bank	Net Deposit Surplus (+) or Deficit (-)[a]			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Agrani	-710,306	108,736	-270,377	871,948
Janata	-742,254	-85,103	-131,322	958,678
Rupali	-304,192	-157,484	1,532	457,145
Sonali	-746,289	94,871	-161,210	1,006,399
BKB	-302,542	156,770	48,542	97,237

[a] The quarters refer to January-March, April-June, July-September, and October-December.

Table 2. Results of the Regression Model

Variable	Parameter estimate	t-ratio
Intercept	0.3179	15.96
Size of Branch (Taka)	-5.6081E-08	-2.06[b]
Average Account Size (Taka)	-0.00001	-0.197
Government Deposits Share (%)	0.0756	2.31[b]
Fixed Deposits Share (%):		
3-<6 months	0.2625	3.22[a]
6-<12 months	-0.0847	-1.13
12 -<24 months	-0.1078	-2.97[a]
24 -<36 months	-0.3774	-3.56[a]
36 + months	-0.1348	-5.83[a]
Call Deposits Share (%)	0.1435	5.25[a]
Time-Demand Deposits Share (%)	0.1379	6.50[a]
Savings Deposits Share (%)	-0.0252	-1.53
% Agri. Labor Force	-0.0020	-2.97[a]
Location, Urban = 1	-0.0129	-2.18[b]
No. of Types of Deposits	-0.0090	-5.89[b]
R-square	0.085	
Sample Size	3711	
F-value	25.05	

[a] Significant at the 1 percent level
[b] Significant at the 5 percent level

Note: The model is significant at the 1 percent level.

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