Stability of Small Balance Deposits

A Technical Note

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January 2008

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Abbreviations

BOB	Boliviano
BPR	Bank Perkreditan Rakyat (People's Credit Bank)
CPI	Consumer Price Index
EBL	Equity Bank Limited
EBS	Equity Building Society
EUR	Euro
GDP	Gross Domestic Product
GEL	Georgian Lari
GNI	Gross National Income
IMF	International Monetary Fund
KES	Kenyan Shilling
KSE	Karachi Stock Exchange
LDKPs	Lembaga Dana dan Kredit Pedesaan (type of small rural bank in Indonesia)
MFI	Microfinance Institution
NGO	Nongovernmental Organization
PFF	Private Financial Funds (type of regulated non-bank microfinance institution in Boliva)
PLS	Profit and Loss Sharing Account (Savings Account)
PPP	Purchasing Power Parity
PRODEM	Fundación para Promoción y el Desarrollo de la Microempresa
SBD	Small Balance Deposit
SBEF	Superintendent of Banks and Financial Entities of Bolivia
USD	U.S. dollar
VTB	Vneshtorgbank

1 Research Objectives

The classic model for retail banking is the transformation of customer savings into productive loans and investments. Individual customer deposits are often small in size, and they are available for redemption on short notice, while loans and investments require longer term commitments and larger unit sizes. Today some of the largest banks in the developed world act as agents of "disintermediation"—that is, they facilitate direct links between retail savers and investment projects or corporations via capital markets. Nevertheless, for most small and medium-size businesses, the classic bank financing model remains highly relevant, because a direct issuance of debt or equity into the capital markets is simply not feasible, and it is rarely cost efficient. This holds particularly true for emerging and developing markets, where micro and small businesses constitute the economic backbone and hold the key to accelerated job creation and growth.

The liability side of bank balance sheets in these markets typically consists of the equity required by prudential regulation and customer deposits—and not much else. As such, these banks are case studies of core deposit theory at work: many small customer deposits, although individually quite variable in their balances and often contractually available to the depositor on demand, constitute in their aggregate a very stable and inexpensive core funding base for the bank.

However, one of the biggest challenges to economic development in poor countries is creating cost-efficient savings opportunities and access to small business finance in environments where the majority of the population remains unbanked. Small balance demand deposits from poor clients are viewed as a particularly volatile class of funding. Low-income individuals are thought to transact more frequently than account holders with larger balances, and they are believed to be more prone to income disruptions from recession, natural disasters, health issues, crime, and other factors. For these reasons, microfinance institutions (MFIs) that are stepping into this underserved space are concerned about using deposits to fund their lending operations. In addition, regulators often mandate very strict statutory liquidity and reserve requirements that limit or effectively prohibit the intermediation of "micro" customer deposits into lending activities.

The objective of this research is to put the conventional core deposit theory to the test by examining the actual behavior of deposits raised from poor individuals. This study focuses on five institutions in developing and emerging markets that, all but one, have large deposit volumes from low-income savers, and it asks the following:

- Are deposits raised from poor individuals a stable base of long-term funding for the institution?
- How volatile are the aggregate balances of demand deposits compared to larger term deposits?
- Are there any recurring seasonal supply patterns at work?
- How long is the experiential average life of a passbook savings account (one that contractually can be redeemed on demand)?
- How do known external events (natural disasters, political turmoil, war) and certain institutional actions (pricing, marketing campaigns, etc.) impact deposit supply?

The essential data requirement for this type of analysis is a long-run time series of tightly spaced aggregate deposit supply by product group (demand savings deposits, transaction accounts, and term deposits). Volatility of deposit supply and the resulting consequences for the liquidity of the institution manifest themselves on a daily basis, not on average monthly values. Therefore, daily (or at least weekly) data points are preferable for a meaningful analysis. Unfortunately, this type of data was surprisingly difficult for the institutions to reconstruct from their information technology systems. Although the study team would have preferred to conduct a much broader cross-sectional study on a statistically significant sample of deposit-taking MFIs and banks, the team had to be content with a handful of datasets from those institutions that invested the effort to generate the detailed data for the study.

While the case studies presented in this research will not support any general inferences on small balance deposit behavior in developing countries, they should provide initial evidence and encouragement to study a broader cross-section of deposit-taking institutions.

2 Research Methodology and Definitions

2.1 DEFINING "SMALL BALANCE DEPOSITS"

To track small deposits placed by poor savers, we first define more clearly the nature of small deposits and the methods for distinguishing them from other deposits raised by the institution.

Note that the object of the research is limited to voluntary retail deposits; it excludes compulsory deposits that are frequently used in microlending programs. Compulsory deposits are contractually bound, and they are held either in expectation of a loan or as cash collateral for a parallel loan exposure. Therefore, such deposits are a direct function of the lending business rather than subject to autonomous deposit supply behavior.

It is tempting to define small-balance deposits (SBDs) using a simple absolute threshold, such as "account balance must be less than US$500 in local currency equivalent." Of course, such an absolute threshold would have to be set separately in each instance relative to the income levels in the community.

In his research with the World Savings Banks Institute, Steve Peachey finds that savings banks in the poorest 20 percent of countries operate with an average savings balance that is roughly a quarter of per capita gross national income (GNI).[1] At this ratio to average income, Peachey believes mass access to financial services is possible. The same relationship between average deposit size and per capita GNI can be observed in rich European countries with strong savings banks (e.g., France, Germany, and Spain). These countries successfully reach the mass and middle market and contribute to very high levels of access to finance. For commercial banks in developing countries, the situation is often very different. According to World Bank data, per capita deposits average five to six times per capita GNI in the poorest fifth of countries, a ratio that is compatible with servicing the needs of only the top end of the market. Thus, setting the cut-off for the definition of SBDs at 100 percent of GNI per capita—*or* ideally below—is likely a better starting point than an arbitrary absolute threshold.

However, when defining SBDs only in terms of account balance thresholds, data consistency becomes a major issue. It is relatively easy to

1 Access to Finance: What Does It Mean and How Do Savings Banks Foster Access, Steve Peachey, quoted as per Q&A session on Microfinance Gateway (www.microfinancegateway.org).

take a snapshot of a financial institution at a recent particular date and stratify deposit accounts by balance. The problem arises when trying to trace those accounts through a long-run time series. An account that qualifies as small on day one may not qualify as small a year later. Individual accounts will migrate between the large and small categories over time as savings are built up or drawn down and as deposit accounts are opened and closed. Tracking the behavior of only small accounts would eliminate the large movers among the accounts, which are likely to contribute substantially to the volatility of the total deposit balances. But since the volatility of deposit aggregates is the object of this study, it would lead to tautological results to base the analysis only on the variations in those "stable" accounts that remained on the books and consistently fell into the small classification.

Alternatively, one could approach the definition from the angle of the account holder, qualifying only those accounts held by low-income individuals. Including the demographics of the depositors into the SBD definition makes intuitive sense: a US$300 deposit paid in and forgotten about by a relatively rich person (say to start a dowry account) will behave very differently in terms of number of transactions and balance volatility from a US$300 account held by a poor person, for whom these savings represent the most important financial asset in the household. Unfortunately, it is not practical to classify thousands of accounts per institution by demographics, presumed savings intentions, and usage patterns of the account. Such an approach would lead the study into anecdotal territory and would distract from the goal of gathering quantitative evidence on the behavior of aggregate deposit balances.

Therefore, the most pragmatic method to define SBDs is to combine a stratification of account sizes by product, with a general description of the institution's customer demographics. To that end, this study examines only those institutions whose customers are primarily low-income households and then hones in on those deposit products that display a majority of small accounts as per the definition for the local community. This definition of small is based on account size in relation to the poverty line and to the per capita income in the country.

Rather than isolate the small accounts in each product category, this study tracks the entire deposit volume in the predominantly small-product or product group as a qualifying SBD portfolio. This approach better captures size migration and depositor substitution effects over time, and it does not create even more complex data requirements. Extracting narrowly spaced time series of aggregate deposit balances for several years back is

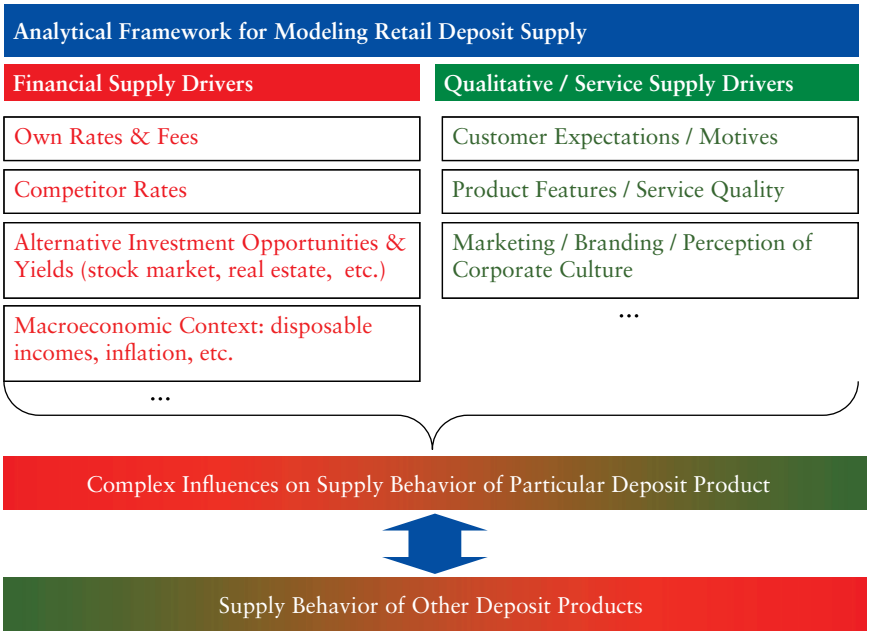
already very difficult for most institutions. It would have been unrealistic to retrace these time series on a per-account basis and cross-reference them with (historical) demographic data.

Within the total customer deposits for the institutions, this study distinguishes just three broad product categories: demand savings versus term deposits and (where applicable) transaction account balances. Demand savings include ordinary savings accounts, passbook accounts, and notice accounts with short notice periods. Term deposits are distinguished by higher interest rates and a fixed term. They also require a minimum deposit amount that will already exclude most poor savers from access to term deposits. Transaction accounts are current accounts or checking accounts held by individuals and businesses primarily to receive and transmit funds rather than to serve as a vehicle for investment or accumulation of resources.

2.2 RESEARCH METHODOLOGY

This study does not seek to develop a closed-form model of deposit supply that would allow an institution to forecast its aggregate deposit balances for particular products as a function of certain input variables. Many banks in developed markets create such predictive models based on their particular franchise, customer demographics, and competitive positioning. However, aggregate deposit supply is the result of atomistic customer decisions driven by myriad motives. One therefore cannot expect to find a single generalized closed-form model of depositor behavior. Rather, individual banks try to fit multivariate regression models to the observed supply behavior using a unique set of independent variables that best describes the market behavior as perceived by the particular institution. Such independent variables include customer service, product features, absolute level of interest rates, relative pricing compared to competitors, reputation factors, macroeconomic and seasonal cycles, relative attractiveness of other investments, changes in the liquidity preference of customers, and so on. Explaining deposit supply with predictive power for an individual institution is highly complex and will yield a different model for each institution. Figure 1 summarizes a typical reference framework used by commercial banks in modeling deposit supply.

Figure 1: Analytical Framework for Modeling Deposit Supply



The outlines of predictive deposit supply modeling are presented here only to make clear what this study *will not* attempt to do. There is no way that an external multi-institution study could have access to sufficient internal data and have deep enough insights into the organization and its distribution channels and the competitive dynamics in the local market to construct a credible predictive model.

Instead, this study takes a few simple measures of the actual deposit supply as it has materialized over time given the institution's strategy and actions (as well as external and market influences), keeping in mind that many of these factors may not even be explicitly known to the research team.

In describing deposit supply outcome using the techniques and measures set out in the following, this study attempts only to indicate how volatile SBDs really have been, given a particular set of institutional circumstances and management actions. This study *does not* attempt to make predictions that are applicable across institutions. However, an institution might benefit from applying similar methods with its own data and coming to its own conclusions.

The descriptive analysis of each institution's deposit supply is based on the following six measures:

1. Long-term trend
2. Core deposit trend
3. Seasonal patterns
4. Annualized (daily) volatility
5. Average life of demand deposits
6. Peculiar patterns, trend breaks, and outlier values

These measures (and their definitions) were selected to serve as a practical guide for how to get started on modeling deposit supply. Similar statistics are tracked by many banks and reported regularly to asset and liability management committees that use them in determining their balance sheet positioning. For example, as a result of its participation in this study, Allied Bank Ltd. incorporated average life and volatility statistics into its regular asset and liability management dashboard. It subsequently decided to conduct even more detailed demographic studies on stratified samples of its depositor base.

(1) Long-term trend

Regression is calculated on more widely spaced (monthly) deposit balances per product with respect to time to detect any underlying long-term trend for balance growth or decline. Given that the long-run time series is subject to compounding effects from interest-on-interest and inflation, a logarithmic regression using the LOGEST() or GROWTH() functions in Excel typically provides the best fit in describing exponential long-term trends.

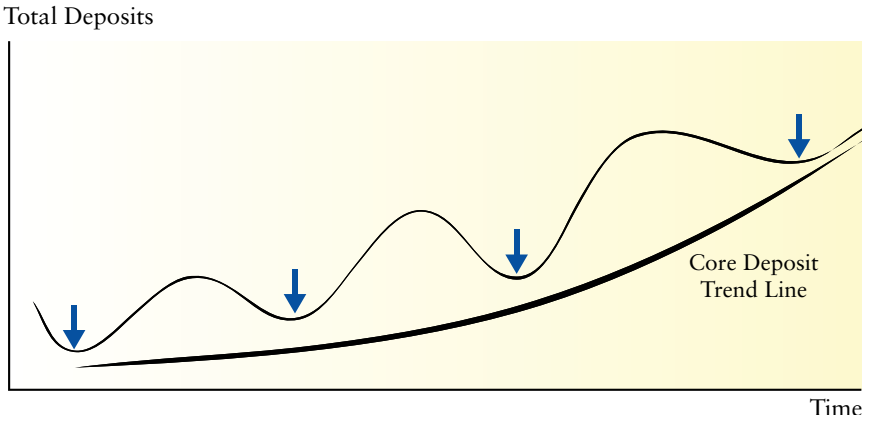
In some cases, a simple logarithmic trend estimate did not provide a good fit for many of the observed values. For example, the logarithmic trend could not account for obvious trend breaks, known external events, or unique outlier observations. Where such situations were immediately apparent from the trend graphs, corrected trends have been calculated by introducing additional categorical (dummy) variables into the logarithmic regression. For example, if it were obvious that demand deposit supply was substantially lower during a known period of civil unrest, then an explanatory dummy variable of the type "Civil Unrest Yes = 1; Civil Unrest No = 0" was introduced alongside each observation date.

(2) Core deposit trend

Using a simple graphical inspection of the long-term balance plots, local minima or turnaround points in the deposit supply per product are identified. By looking at the development of just these minimal values over time,

the magnitude and growth trend of the core deposits (i.e., the amount of long-term predictable funding generated by the deposit-taking operations) can be estimated (Figure 2).

Figure 2: Estimating the Core Deposit Trend Using Local Minima



Using a regression on the local minima with respect to time, an exponential curve is fitted to the observations. This curve can also be extended into future periods to derive a simple forecast of core deposits—assuming that the underlying dynamics remain intact.

(3) Seasonal patterns

Based on the long-run monthly time series, seasonal fluctuations are examined using a relative index that captures the month-by-month deviation from the long-run trend calculated as per (1). As a result, this analysis could show that, over a five-year period, the savings balances observed at the end of June were on average 105 percent of the incremental trend balance otherwise expected for that month, while December 31 volumes on average were only 91 percent of the long-run trend. Understanding such seasonal patterns in deposit supply is a great help in planning for liquidity consequences and devising offsetting strategies, such as rate promotions or wholesale borrowing alternatives.

One can use the seasonal index to derive an improved, seasonally adjusted forecast of deposit supply by multiplying the long-term trend forecast with the average seasonal index for a particular calendar month.

However, when interpreting seasonal index values, keep in mind the level of their statistical significance. For example, a seasonal peak of 107 percent in savings supply in June could be the result of three closely clustered observations of 105 percent, 107 percent, and 109 percent, or it could

have been calculated as the average of two observations below the trend line, say 96 percent and 97 percent, combined with a very high outlier of 128 percent. Together with the average seasonal index, one should therefore calculate a measure of determination that captures the closeness of the fit of the seasonal index to the observed deviations from the trend. This can be done with any statistical software package that calculates a correlogram of autocorrelations on a time series. Autocorrelation measures the predictive fit of a time series in the sense that the previous value explains the immediate next value or a value that is a cyclical distance (or a lag) of a certain number of months away. In a perfect annual seasonal cycle, the lags with the highest measure of determination would be close to the origination point (0–3 month lag) and then high again around 12 months.

(4) Annualized (daily) volatility

Because annualized volatility goes directly to the heart of how variable the deposit supply really is on a daily basis, this study requires a volatility measure that is independent of size and can be easily compared across institutions. To meet these conditions, a standard deviation expressed in percent per annum calculated on frequent (ideally daily) logarithmic relative balance changes is used. Such a volatility measure is widely used on equity returns or foreign exchange rates, and it corresponds well to the notion that the incremental variations in the deposit balances are stochastic events resembling a classic random walk. The logarithmic return calculation nets out the underlying exponential growth trend that is likely at work on the balances, and it reduces the result to the stochastic element in the balance supply. One can argue that the daily variation in the aggregate supply of many small-balance accounts is indeed normally distributed around the logarithmic trend mean. A normal distribution is always plausible to assume, when the realization of the random variable (the sum total of SBDs) is influenced by a great number of mutually independent and potentially off-setting effects. For example, customer A makes a larger than usual deposit, customer B misses the bus and does not withdraw his savings, customer C works overtime and receives a larger than normal payroll deposit, and so on.

(5) Average life of demand deposits

The (weighted) average life is a concept commonly used when trying to ascertain cash flow properties, liquidity, and interest rate risk properties of a portfolio of demand or "noncontractual maturity" deposits. Using periodic decay rates (e.g., every year you expect to lose 20 percent of existing

balances in ordinary savings accounts), banks estimate the cash flow profile of an existing portfolio of accounts, which can be used to determine its net present value and the responses in value due to assumed changes in product rates paid and market discount rates. One can also calculate the weighted average life of a set of existing accounts based on these cash flows and use that result as the time-band slotting criterion in a traditional interest rate sensitivity or contractual maturity gap report. The U.S. Office of Thrift Supervision, for example, maintains a set of standard balance retention models and decay parameters, but it also allows institutions to develop their own estimates based on their particular franchise.[2]

Balance sheet-based gap reports consider only existing assets and liabilities and the rate sensitivity of their associated flows. Therefore, most deposit supply analysis distinguishes between (*i*) the decay rate or corresponding balance retention rate and the resulting average life of existing balances and (*ii*) the supply of new balances into existing or new accounts (Farin 2004).

The distinction between the decay of existing deposits and the supply of new balances is unnecessary and arbitrary when looking only at the liquidity profile of an institution and its ongoing deposit supply as one of its primary sources of funding. The distinction is also difficult to bear out in actual data, unless one analyzes individual transactions on individual accounts. Only then can one say that the starting balance minus all withdrawals defines the decay trajectory, while each subsequent credit to the account is deemed a new balance supplied. This study proposes a simpler methodology to calculate average life based on periodic closing balances for individual accounts or aggregate product balances. Here, the closing balances are the combined result of balances retained and new balances supplied.

Average life is calculated as follows: (*i*) an adequate sampling period is chosen (e.g., two years of month-end balance data as in the following illustration); (*ii*) the fluctuating account balances are examined in terms of layers of individual dollars; and (*iii*) the number of days each dollar was "present" in the account is determined. For simplicity, it is assumed that the month-end balance was in the account unchanged for the entire month. Figure 3 clearly depicts these balance layers. The bottom $5,567 were present for the entire period, while the top $4,000 in the $20,000 peak balance of April 2005 were present only for those 30 days in April.

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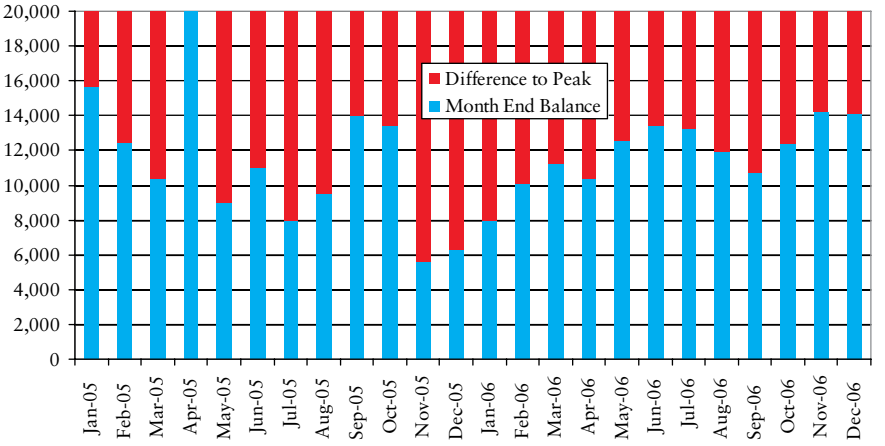
2 Compare Office of Thrift Supervision: Examination Handbook, Interest Rate Risk Management Section 650, available from http://www.ots.treas.gov.

Figure 3: Balance Profile in Sample Account



The calculation of the weighted average life on these balances is summarized in Table 1: the month-end balance multiplied by the number of days in the month equals the dollar-weighted days on book (dollar*days) in the right-hand column. Dividing the total dollar-weighted days on book by the sum of the weights (i.e., the maximum balance during the period) gives the weighted average life of the balances in number of days.

$$\textbf{dollar-weighted days on book} = \textbf{(month-end balance)} * \textbf{(number of days in month)}$$

$$\textbf{average life} = \frac{\sum \textbf{dollar weighted days}}{\sum \textbf{weights}}$$

Table 1: Sample Weighted Average Life Calculation

WEIGHTED AVERAGE LIFE

Sample Demand Deposit Account

	Month End Balance	Dollar * Days
31-Jan-05	15,673	485,863
28-Feb-05	12,450	348,600
31-Mar-05	10,340	320,540
30-Apr-05	20,000	600,000
31-May-05	9,000	279,000
30-Jun-05	11,000	330,000
31-Jul-05	8,000	248,000
31-Aug-05	9,490	294,190
30-Sep-05	14,000	420,000
31-Oct-05	13,450	416,950
30-Nov-05	5,567	167,010
31-Dec-05	6,320	195,920
31-Jan-06	7,950	246,450
28-Feb-06	10,100	282,800
31-Mar-06	11,200	347,200
30-Apr-06	10,350	310,500
31-May-06	12,569	389,639
30-Jun-06	13,450	403,500
31-Jul-06	13,250	410,750
31-Aug-06	11,920	369,520
30-Sep-06	10,670	320,100
31-Oct-06	12,345	382,695
30-Nov-06	14,215	426,450
31-Dec-06	14,100	437,100
Total		**8,432,777**
Days Weighted Average Life		**422**

= Sum (Dollar * days) / MAX(Month End Balance)

(6) Peculiar patterns, trend breaks, and outlier values

As an additional measure, this study attempts to link observed trends, peculiar patterns, localized disruptions, and outlier values to certain institution internal and external explanatory factors. These stress events include operational issues, product features, marketing, absolute and relative pricing, regional economic events and trends, crises and disasters, exchange rate developments, and other macroeconomic factors.

This step is not an attempt to construct a definitive model of deposit supply nor is it an attempt to craft a specific formula that uses these internal and external factors as inputs. It is merely an attempt to find plausible ad hoc explanations for obvious developments based on limited knowledge of the operating environment and discussions with contacts in the institution. Closer scrutiny could reveal that these explanations are more coincidental than causal.

To better understand the development at a particular institution compared to a wider market perspective, this study often benchmarks institution-specific figures against consolidated commercial bank data as published by the central bank. Keep in mind, however, the limited relevance of system-wide deposit aggregates as compared to the individual bank's perspective. One must typically expect much lower volatility of deposits overall, because of compensation effects—that is, one institution's deposit loss is another bank's gain. In the final analysis, systemwide statistics of deposits are primarily driven by macro effects, such as liquidity preference of households and corporations, velocity of money, market interest rate levels, and foreign exchange rates. In the extreme, one could imagine a situation where the bank in the study experiences a near fatal run on its customer liabilities that are redeposited rapidly at large "safe haven" banks, thus leaving total site deposits in the banking system unchanged.

3 Allied Bank Limited, Pakistan

3.1 BANK PROFILE

Allied Bank Limited is the fourth largest domestic commercial bank in Pakistan, following National Bank of Pakistan, Habib Bank, and United Bank. Allied Bank maintains a domestic A+ rating by JCR-VIS, the Pakistani affiliate of Japan Credit Rating Agency, Ltd.

Allied Bank was first incorporated in Lahore in 1942 as Australasia Bank. It was renamed Allied Bank of Pakistan Limited in 1974 after being nationalized and merged with Standard Bank and Commerce Bank of Pakistan. The first wave of bank privatizations in 1991 led to a difficult period for Allied Bank under employee ownership. This period saw high nonperforming loan rates and resulting capital and liquidity constraints. In August 2004, the State Bank of Pakistan arranged the recapitalization and sale of Allied Bank to the Ibrahim Group of Lahore, one of the premier industrial groups in Pakistan with a strong base in the textile sector. The remaining free float of Allied Bank shares is actively traded on the Islamabad, Lahore, and Karachi stock exchanges.

Today, Allied Bank offers universal bank services with a strong focus on retail banking. The bank maintains a network of 700 online branches in Pakistan as well as an off-shore presence in the Middle East. On top of its US$4.2 billion balance sheet, Allied Bank earned a record US$72.8 million after-tax profit in 2006, thus achieving its 2 percent full-year target return on average assets. Recent increases in profitability have contributed to the necessary capital build-up, which is still tight at just over 9 percent of risk-weighted assets.

The bank continues to recover from the troubled legacy portfolio created under the previous management, and it is rebuilding its lending franchise. The loan portfolio increased to US$2.4 billion by year-end 2006, posting a growth of almost 30 percent over the previous year. The ratio of nonperforming loans to gross loans stands at 7.2 percent, down from 11.4 percent in the previous year. The provisioning coverage ratio of nonperforming loans has been brought up to 73 percent against 68 percent in the previous year.

Allied Bank maintains a large retail deposit base that amounts to 82 percent of total assets. It offers a full range of transaction accounts as well as demand and term savings products and savings plans with regular

scheduled contributions. As of October 2006, Allied Bank served a total of 2.3 million client savings, transaction, and term deposit accounts.

The bank is investing heavily in automation and IT infrastructure to improve its customer service and achieve cost efficiency. Allied Bank recently signed an agreement with Temenos to implement T24 core banking software throughout its branch network. In November 2006 it was named Bank of the Year in Pakistan by London-based *The Banker* magazine. The award is given annually to one bank in each country based on key performance indicators.[3]

3.2 REGULATORY CONTEXT

The commercial banking sector is supervised by the State Bank of Pakistan, in line with international prudential and regulatory norms. Bank solvency requirements are managed in accordance with the 1988 Basel Capital Accord; market risk amendments are currently being introduced. Preparations to phase in the Revised Capital Adequacy Framework (Basel II), including capital allocations against operational risk and risk-weight differentiations on the credit risk side, are already underway.

Liquidity in the banking sector is regulated via required minimum reserves and additional statutory liquid asset requirements. Weekly average reserves with the central bank are currently required at 7 percent of demand liabilities and time deposits of up to six months tenor. Longer term deposits are reservable at 3 percent. The additional Statutory Liquidity Requirement mandates liquid assets beyond required central bank reserves of 18 percent of total time and demand liabilities.

The State Bank of Pakistan also receives regular stress test reporting on the effects of various liability run-off scenarios and requires banks to submit a contractual maturity gap report that stratifies all assets and liabilities along prescribed time bands as per their contractual maturity. Contractual maturity gaps tend to be large, indicating substantial liquidity risk, as all commercial banks in Pakistan are predominantly funded by demand and short-term customer deposits. Banks are keenly interested in improving their understanding of the experiential behavior of demand deposits, which are expected to have average lives far in excess of contractual maturity and display little volatility on their aggregate balances over time. As commercial banks increasingly try to capitalize on the growing demand for long-term loans, it is very important to them to be able to make a well-documented case to the State Bank for classifying demand and term liabilities by average expected prolongation behavior rather than by contractual maturity.

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3 For more background on Allied Bank, see http://www.abl.com.pk.

3.3 INCOME CONTEXT

Poverty is widespread in Pakistan. Per capita gross national income (GNI) in 2005 stood at US$690 under the World Bank Atlas method and at US$2,350 using the purchasing power parity (PPP) method.[4] For comparison, high-income countries average US$35,131 (Atlas) and $32,524 (PPP). The World Bank estimates that 17 percent of the Pakistani population lives below the international poverty line of US$1 a day.[5]

3.4 COUNTRY BACKGROUND AND STRESS EVENTS

Solid economic performance (average annual GDP growth of 7.6 percent for 2004–2006) and a healthy private sector credit expansion have recently made the retail deposit supply a constraining factor to further growth of the banking sector in Pakistan. Banks are actively mobilizing additional deposits from the unbanked cash economy and are searching for alternative, preferably longer dating, liabilities to fund the growing private sector credit demand.

Over the last 10 years, Pakistan has seen a number of macroeconomic and political events that may have impacted retail depositor behavior. Each of the following events is analyzed as part of this study.

- **Nuclear testing (May 28, 1998):** Two weeks after India performed nuclear tests, Pakistan responded by detonating five underground nuclear devices in Pakistan's southwestern province of Balochistan.
- **Kargil conflict (May–July 1999):** An armed confrontation arose between India and Pakistan in the Kargil district of Kashmir. The cause of the war was the infiltration of Pakistani soldiers and Kashmiri militants into positions on the Indian side of the Line of Control, which serves as the de facto border between the two nations.
- **Musharraf coup (October 12, 1999):** General Pervez Musharraf accused the government of "systematically destroying" state institutions and driving the economy toward collapse. On October 12, the military closed the airports and placed Pakistani Prime Minister Nawaz Sharif under house arrest, and Musharraf took over control of Pakistan.
- **Terrorist attacks on the United States (September 11, 2001):** The connection to the Taliban regime in neighboring Afghanistan and terrorist links to tribal areas in Pakistan created apprehension and political tension in Pakistan.
- **U.S. military action in Afghanistan (October 7, 2001)**

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4 See World Development Indicators database, World Bank, July 2006, www.worldbank.org.
5 Ibid.

- **Presidential referendum (April 30, 2002):** The country held a national referendum to elect President General Pervez Musharraf to a five-year term. According to the Election Commission of Pakistan, General Musharraf won the referendum by securing 98 percent yes votes. However, the constitutional status, turnout, and conduct of the polling were marred with deep controversy.
- **Suicide bomb attacks in Karachi (May–June 2002):** Fourteen people, including 11 French nationals, were killed in a suicide attack on a bus in Karachi. In June, 12 people were killed in a suicide attack outside the U.S. consulate in Karachi.
- **General parliamentary elections (October 2002):** The first general election since the 1999 military coup resulted in a hung Parliament. Parties haggled over the make-up of a coalition. Religious parties fared better than expected. In November 2002, Mir Zafarullah Jamali was selected as prime minister by the National Assembly. He was the first civilian premier since the 1999 military coup, and he was a member of a party close to General Musharraf.
- **U.S.-led invasion of Iraq (March 20, 2003)**
- **Recapitalization and sale of Allied Bank (August 2004):** As advised by the Privatization Commission, the State Bank of Pakistan carried out a restructuring plan whereby the Ibrahim Group took over 75.35 percent of the capital of the bank following a public bidding process.
- **Stock market crash (March 2005):** Pakistan experienced a severe crash in the Karachi Stock Exchange (KSE) index in March 2005. The KSE 100 index previously had risen by 65 percent from 6,218 points on December 31, 2004, to 10,303 on March 15, 2005, and then sharply declined from March 16, 2005, to March 28, 2005, by 25 percent to 7,708 points.
- **Suicide bomb attacks in London (July 7, 2005):** Four suicide bombers struck central London killing 52 people and injuring more than 770. Three of the four bombers were of ethnic Pakistani background and had active connections to terrorist networks operating from Pakistan.
- **Allied Bank shares listed on Pakistani stock exchanges (August 2005):** The free float in Allied Bank shares was listed for trading on the Islamabad, Lahore, and Karachi stock exchanges.
- **Kashmir earthquake (October 8, 2005):** A major earthquake registering 7.6 on the Richter scale occurred with its epicenter in Pakistan-administered Kashmir. The official death toll on the Pakistani side was 73,276, with a further 1,400 deaths in Indian-administered Kashmir.

3.5 BANK ELIGIBILITY

It is reasonable to question whether Allied Bank has an inclusive enough deposit franchise (i.e., providing access to a sufficient number of poor small savers) to be a relevant case for the objectives of this study. Based on the following data, we believe that it does meet the appropriate criteria.

As of October 31, 2006, Allied Bank held US$1.045 billion (Rs 63.464 billion) in demand savings deposits. Ninety-three percent of these savings were invested in profit and loss sharing (PLS) accounts, a common demand savings product with fixed interest (or mark-up) rates staggered as per balance maintained. Table 2 shows the stratification of these PLS balances as of October 31, 2006.

Table 2: Stratification of PLS Savings Account Balances as of October 31, 2006

AMOUNT BANDS	$ Upper Limit	No. of Accounts	Outstanding Balance Rs. Mio	% of Total Account No.	Cum. % of Total Account No.	% of Total Balance	Cum. % of Balance
0 to less than Rs.100	$2	230,552	1,259	16.60%	16.60%	2.14%	2.14%
Rs.100 to less than Rs. 1,000	$17	504,531	1,984	36.33%	52.93%	3.36%	5.50%
Rs.1,000 to Rs. 10,000	$167	354,564	4,715	25.53%	78.46%	8.00%	13.50%
Rs. 10,000 to Rs. 100,000	$1,667	215,480	10,361	15.52%	93.98%	17.57%	31.07%
Rs 100,000 to Rs 500,000	$8,333	66,114	16,231	4.76%	98.74%	27.53%	58.59%
Rs 500,000 to Rs 1,000,000	$16,667	10,758	8,161	0.77%	99.51%	13.84%	72.43%
Rs 1,000,000 to Rs 5,000,000	$83,333	6,384	12,518	0.46%	99.97%	21.23%	93.66%
Rs 5,000,000 to Rs 10,000,000	$166,667	311	2,168	0.02%	99.99%	3.68%	97.34%
Rs 10,000,000 to Rs 100,000,000	$1,666,667	86	1,432	0.01%	100.00%	2.43%	99.77%
Rs 100,000,000 & above		1	138	0.00%	100.00%	0.23%	100.00%
Total		1,388,781	58,967	1		1	

Unfortunately, Allied Bank—like most banks, even those in fully developed markets—does not have much systematic data on its depositor demographics. The general indications given by the bank point to a broadly diversified retail depositor base, including business owners, professionals, small entrepreneurs, tradesmen (taxi drivers, electricians, mechanics, and others), and salaried earners. Most people in the categories of small entrepreneurs, tradesmen, and the salary class would be considered average-to-low-income earners.

With over 700 branches across the country and a market share of 5–6 percent of all deposits in the Pakistani banking system, Allied Bank has a substantial platform for outreach to low-income clients. Nonetheless, the largest part of the deposit balances is inevitably generated in the large cities

and towns and their surrounding industrial and suburban areas, where much of Pakistan's wealth is concentrated.

We are confident that the ordinary PLS savings account at Allied Bank is a reasonable example of a largely SBD product that is relevant to the objectives of this study. The bank holds an impressive 1.4 million savings accounts, the vast majority of which have quite small balances: 78.5 percent of all PLS accounts in Table 2 have balances of US$167 or less; 94 percent of all accounts amount to less than US$1,667; 735,000 accounts or 53 percent of all PLS accounts amount to less than US$17.

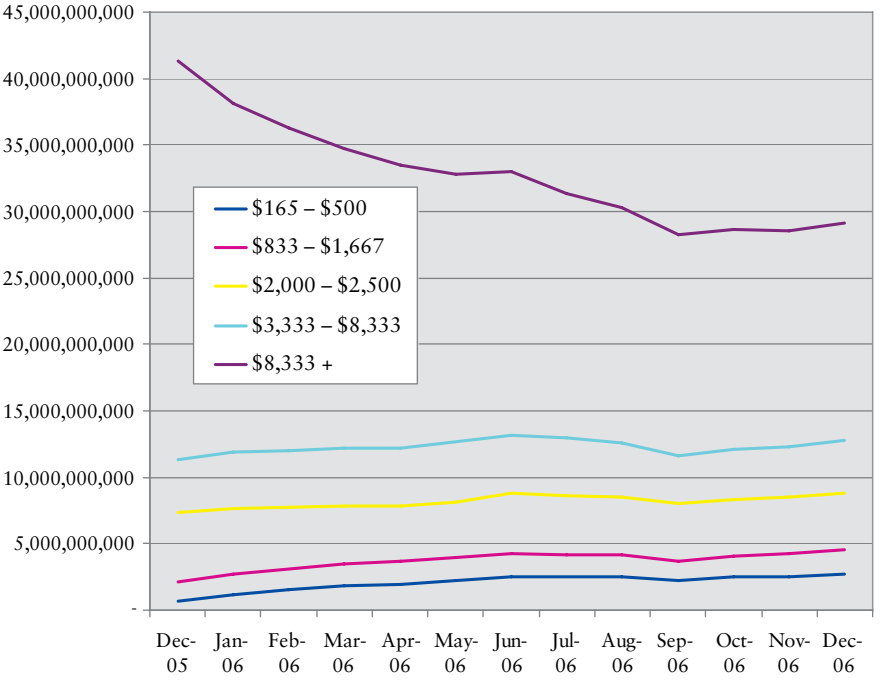
Many of the very small accounts might indeed be dormant and may have been abandoned by the owner who did not bother to formally close the account. As of April 2007, the total balance in dormant PLS accounts was 18.6 percent of the total PLS deposit supply. This does not necessarily disqualify these balances from consideration in the study, however. Allied Bank uses a very restrictive criterion for flagging dormant savings accounts as "no customer transaction for at least one year." For a small savings account (rather than a transaction account), this is not unusual customer behavior. Also, from a liquidity supply perspective, it would be an error to eliminate all dormant accounts from the analysis. In fact, these deposits are the cheapest and least volatile funding the bank can generate. Regulations in Pakistan require that dormant accounts be transferred to the central bank only after 10 years of dormant status.

Although the distribution of PLS accounts (Table 2) is heavily concentrated in SBDs by account numbers, 27.6 percent of the savings supply is held in only 6,782 accounts larger than $16,667. This inevitable balance concentration among the larger accounts could possibly dominate the stability behavior of the entire PLS product such that the large accounts provide the stable basis of funding and obscure the underlying volatility of the small accounts. However, we do not believe this to be the case at Allied Bank.

Allied Bank provided a longitudinal stratification of account balances for a selection of account size ranges from December 2005 to December 2006 (Figure 4). The logic of the data is as follows: the bank identified all PLS accounts with balances in the selected ranges as of December 2005 and then tracked only those accounts for the next 12 months as to their subsequent aggregate balances. In terms of absolute rupee balances supplied, the graphs align strictly by underlying account sizes: the US$165–$500 account range provides the smallest aggregate balance; the accounts above US$8,333 provide the highest aggregate balance. However, Figure 4 also clearly shows

a typical gradual decay among the larger balance accounts, while the two smallest account groups actually quadruple and double, respectively, over the course of the year.[6] Although the large accounts supply a substantial share of the total deposit mass, it is not obvious that they dominate the aggregate balance behavior. That is, it does not seem to be the case that the large accounts are the stable funding and the small balance accounts are excessively volatile but overcompensated by big depositors.

Figure 4: Longitudinal Stratification of PLS Savings Accounts: Aggregate Rupee Balances in Selected Account Size Clusters



We therefore believe it is reasonable to look at the total ordinary savings deposit supply of Allied Bank as a case of SBDs held in large part by low-income households. Hence, Allied Bank qualifies for the research objectives of this study.

6 Note that Figure 4 tracks only those accounts that were in a certain size band at year-end 2005. Any accounts newly opened during the year are excluded.

3.6 LONG-TERM TRENDS AND SEASONAL PATTERNS

Allied Bank provided a long-run time series of total balances in PLS accounts, current (transaction) accounts, and larger time deposit accounts at month end from January 1996 through November 2006. Over the course of almost 11 years, the total balances supplied by the savings accounts tripled, current account balances grew 3.5 times, and term deposits gained 60 percent over the January 1996 value, but only after a long decline that was turned around only recently.

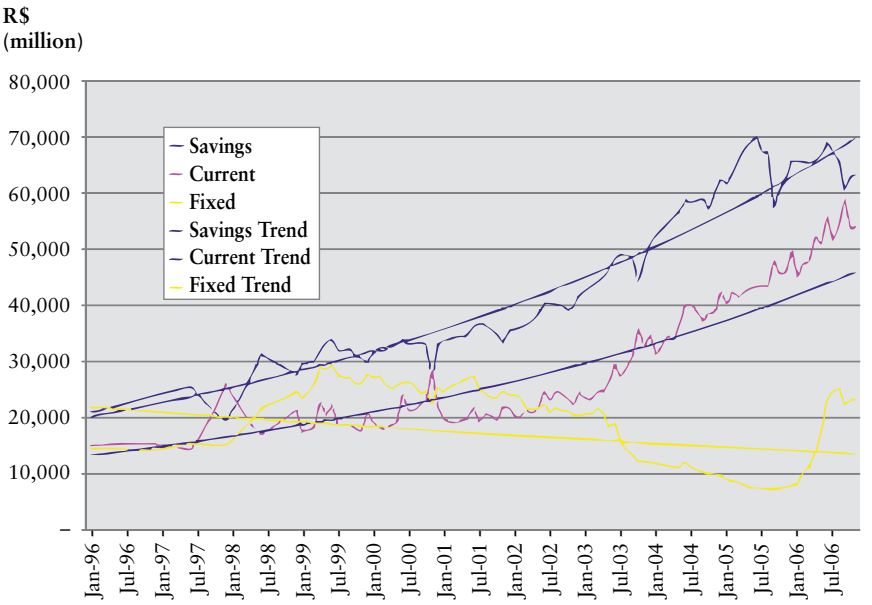
Term deposits (called "fixed deposits" at Allied Bank) require minimum investment amounts and are therefore naturally larger on average than ordinary savings accounts. At the low point for term deposits on November 30, 2005, Allied Bank held a total of Rs 7.6 billion in 28,813 individual term deposits with an average deposit size of Rs 264,000. By October 2006, an aggressive marketing campaign for term deposits brought the number up to 61,451 with an average balance of Rs 381,000 (US$6,272). Also in October 2006, there were an additional 481,654 current transaction accounts with balances of Rs 54 billion, or an average balance of Rs 112,150 (US$1,845) per account.

Figure 5 shows a graph of the monthly balances in all three product categories as well as the corresponding regression curve fitted through the observed balances with the Excel function LOGEST(). The dependent balance values y are thus regressed to time x, using an exponential curve of the form with the parameters indicated in Table 3.

Table 3: Exponential Trend Parameters for Savings, Current Accounts, and Term Deposits

y=b*m^x	b	m
Savings Accounts	0.360096	1.00031
Current Accounts	0.238389	1.00031
Term (Fixed) Deposits	1,437,556	0.99988

Figure 5: Total Monthly Savings, Current Account and Term Deposit Balances, Rs Million



The monthly balance data (Figure 5) are used to calculate a seasonal index for each deposit product that could help detect recurring deviation patterns from the long-run exponential trend. This is done by dividing the actual observed monthly balance for each product by its trend line value and then averaging the resulting index ratios for each calendar month over the 11 years for which observations are available.

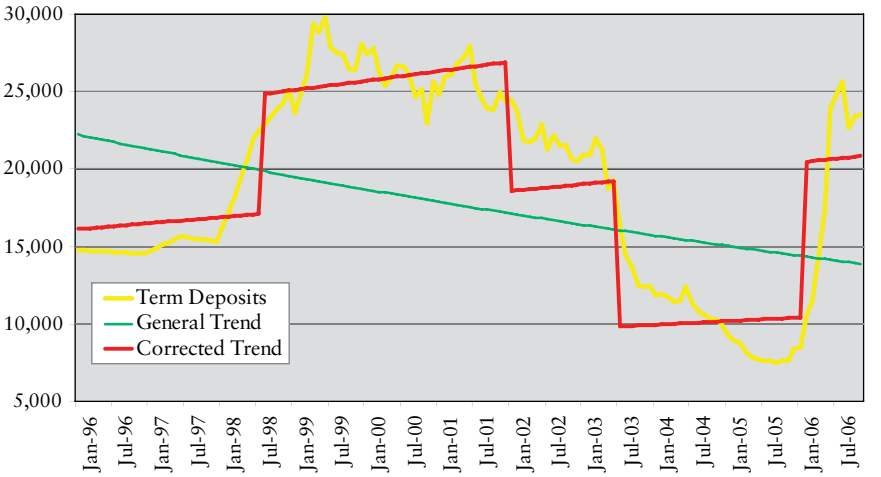
Before proceeding to the seasonal index calculation, a second look at Figure 5 reveals a poor fit of the trend lines during certain time intervals for all three product categories: term deposits fall strongly below their trend during the period of deliberate marketing neglect from July 2003 through January 2006, while from August 1998 to December 2001, term deposits largely exceeded their trend level. Similarly, there are issues of trend fit for savings and current account balances. From November 2000 to October 2003 (roughly), both savings and current account volumes fall consistently below their trend. As discussed in more detail in Section 3.10, 2000–2003 represents a very difficult time for Pakistan economically and politically. This period spans the end of the Kargil crisis, the September 11 attacks, the 2002 Karachi bombings, and the U.S. military actions in Afghanistan. As of late 2003, economic growth as well as foreign aid and investment began to pick up again, leading to a period of relative political and economic stability that may have benefited demand deposit supply.

The problem with a poorly fitting trend line in calculating a seasonal index is that any relevant seasonal cycle may be obscured by an overlay of elevated or depressed deposit supply levels (bias) due to an external effect spanning several years.

To produce a corrected trend, additional categorical (dummy) variables are introduced into the trend regression to capture the supposed external effect. This calculation is accommodated in Excel within the LOGEST() or Growth() functions by expanding the column of independent explanatory values to an array that includes the dummy variable(s) side by side with the date values for each balance observation.

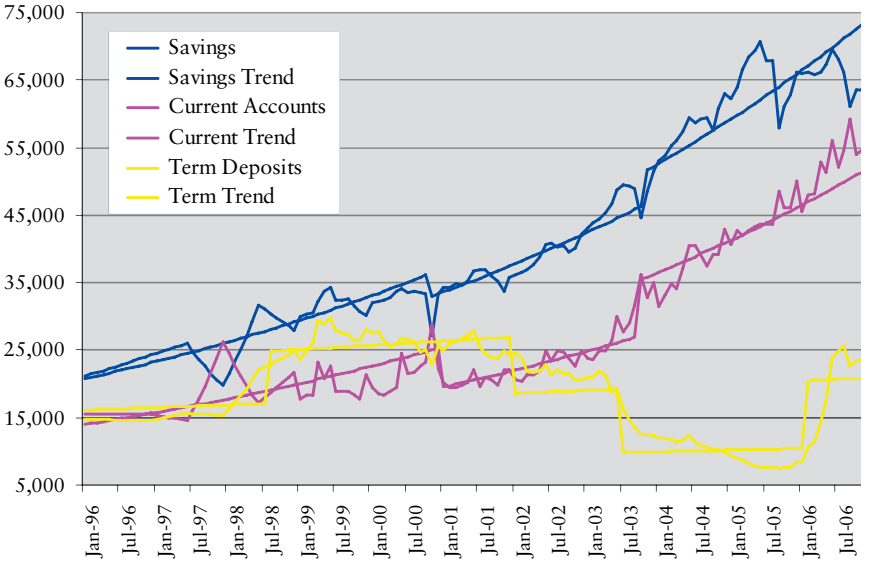
For example, for the term deposits, two dummy variables were introduced: one for the period of deliberate marketing neglect and one for the earlier observation of consistently elevated levels, when Allied Bank paid attractive rates on large term deposits to compensate lagging supply of demand deposits. This produces a corrected trend line (Figure 6).

Figure 6: Term Deposit Balances in Rs Million, General Trend and Corrected Trend Using Two Dummy Variables



Similar dummy variables are applied for the period of depressed deposit supply from November 2000 to October 2003 for both demand savings and current account balances. The corrected trends for demand savings, current accounts, and term deposit balances are shown together in Figure 7. This graph clearly shows the improved fit of the trend lines compared to the general trends (Figure 5) that were regressed to time only.

Figure 7: Total Monthly Savings, Current Account, and Term Deposit Balances, in Rs Million with Corrected Trend Lines



Calculating the monthly values for Actual / Adjusted Trend on the data in Figure 7 gives the average seasonal index values (Table 4).

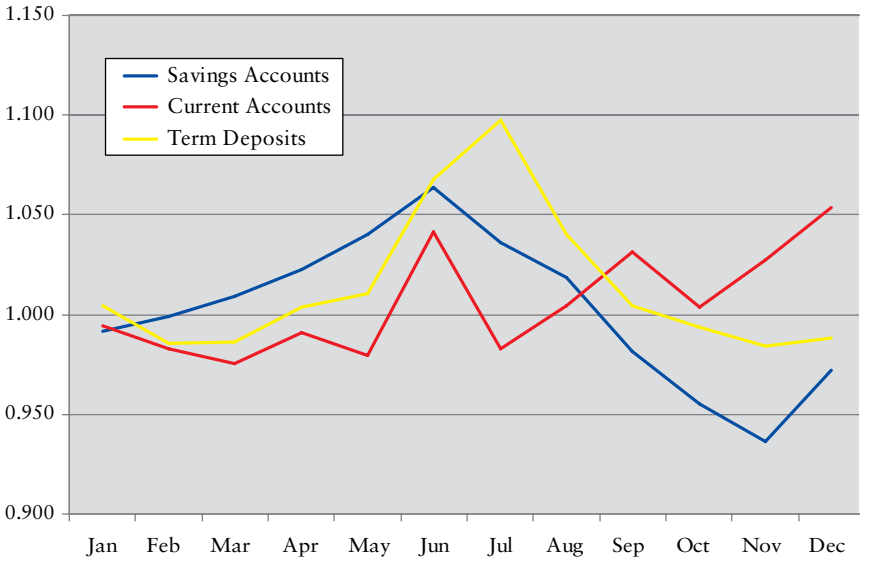
Table 4: Average Seasonal Index Values, by Deposit Type

Average Seasonal Index 1996 - 2006: Actual / Adjusted Trend Value

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Savings Accounts	0.992	0.999	1.009	1.023	1.040	1.064	1.036	1.019	0.982	0.955	0.936	0.972
Current Accounts	0.994	0.983	0.975	0.991	0.980	1.042	0.983	1.005	1.032	1.004	1.027	1.054
Term Deposits	1.005	0.986	0.987	1.003	1.011	1.068	1.097	1.040	1.005	0.994	0.984	0.988

The seasonal patterns contained in Figure 8 become more obvious when the index values are plotted in a line graph.

Figure 8: Graph of Average Seasonal Index Values, by Deposit Type



The most obvious trend is the spike in June deposit volumes across all three product categories. Allied Bank explains the recurring surge in deposit volumes in June and (to a lesser extent) December by pointing to the fact that branch performance measurements are based on the June 30 and December 31 balance sheets. Deposit mobilization is an important performance indicator, which often leads to a rush by branches to generate deposits for those period end dates, even when it is just for a short period.

One can also detect a low point in deposit supply in the fall, particularly for ordinary PLS accounts. As discussed in more detail later, this dip in savings balances largely coincides with the month of Ramadan as it moves through the Gregorian calendar from December to October during the 11 years of data captured.

Being mindful of the general concern about the significance of the average seasonal index raised in section 2.2 (3), a statistical software package was used to calculate the correlograms on the long-run monthly time series for savings, current accounts, and term deposits. Autocorrelations were performed on the monthly series of index values (actual / adjusted trend) for January 1996 through November 2006. Figures 9 through 11 depict the resulting correlograms with the autocorrelation coefficients for various lags (number of months). The autocorrelation coefficient represents the measure

of determination of the serial dependency with the specified lag, and it can range between -1 and 1.

The dotted horizontal lines in the correlograms mark the 95 percent confidence level for testing the hypothesis that there is no serial dependency. That is to say, if none of the autocorrelation bars for various lags goes beyond the range defined by the two dotted lines, one may safely assume that there is no serial correlation. Otherwise, serial correlation may be present in the data.

The graphs seem to indicate that the statistical significance of an annual seasonal cycle for all three deposit categories is low. For lags around 12 months, there are low autocorrelation bars.

Figure 9: Correlogram for Monthly Savings Balances (January 1996 to November 2006)

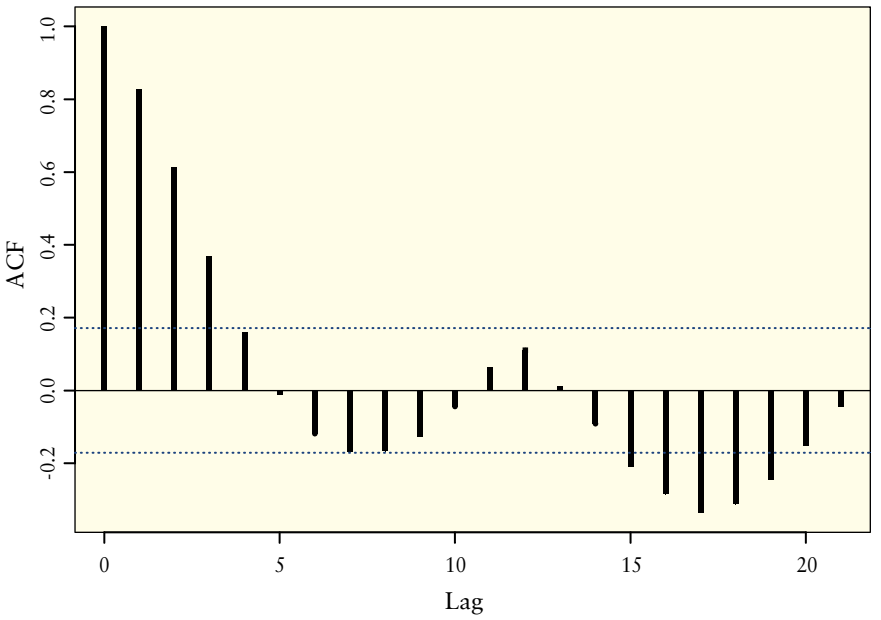


Figure 10: Correlogram for Monthly Current Account Balances (January 1996 to November 2006)

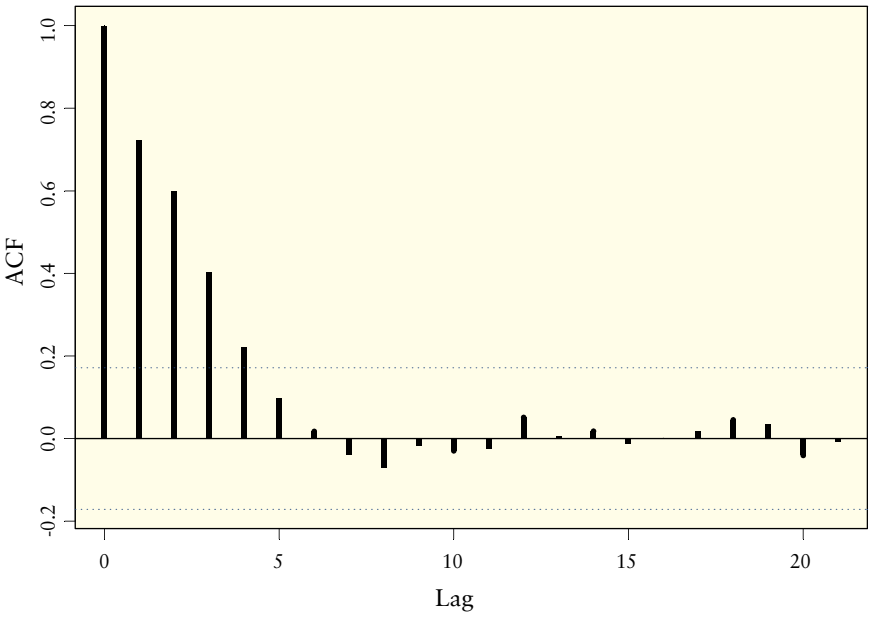
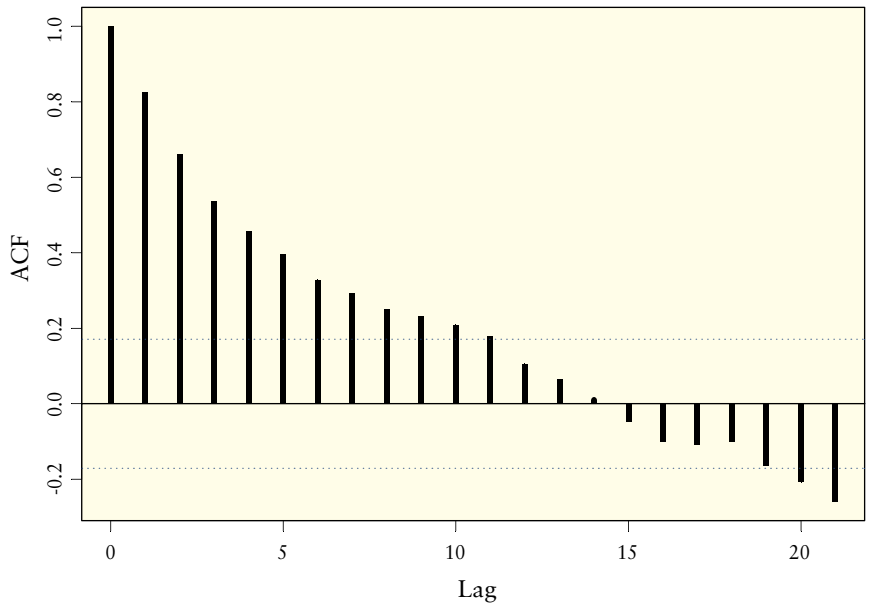


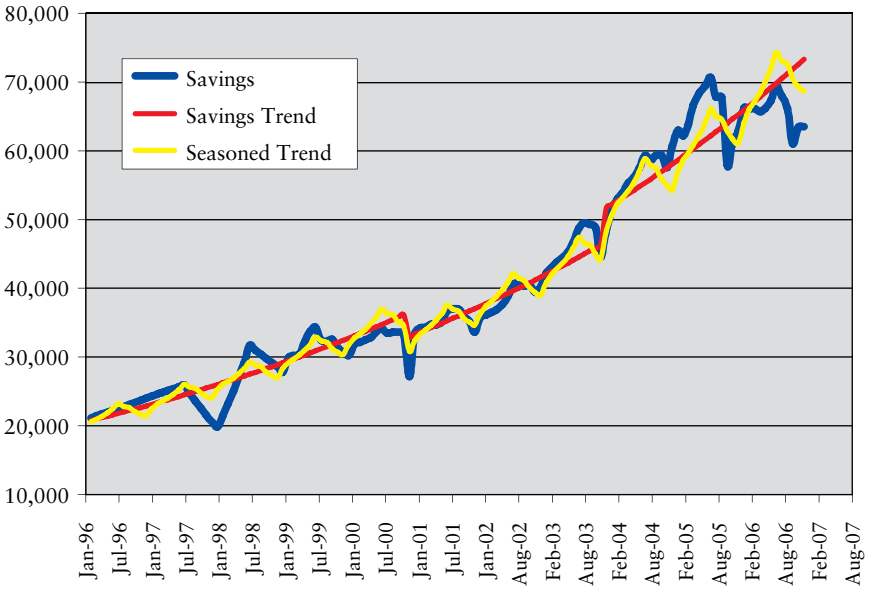
Figure 11: Correlogram for Monthly Term Deposit Balances (January 1996 to November 2006)



It is still of interest to calculate an average seasonal index value per month that indicates an expectation of generally being above trend or below trend for certain months of the year. But in the case of Allied Bank, this seasonal cyclical effect explains only a small portion of the observed variance from the (corrected) trend, while other random, noncyclical influences dominate.

This issue can be visualized by backtesting the seasonal index with the savings balances and (adjusted) trend values upon which it was calculated. In Figure 12 the yellow "seasoned" trend line is derived by multiplying the trend line value with the seasonal index for each particular month. The seasoned trend sometimes improves the fit with the actual savings balances quite nicely, but it is far from explaining the majority of the observed deviations from the main trend line.

Figure 12: Backtesting Seasonally Adjusted Trend Values to the Actual Savings Balances (Rs Million)



The low statistical significance of annual cycle seasonality is actually good news for asset and liability management at Allied Bank. Strong seasonal fluctuations would have limited the utility of the deposit supply for long-term intermediation. Moreover, in cases where there is strong seasonality on the deposit side because of a concentration among customers subject to similar cash demand cycles, one could easily imagine these seasonal swings to coincide with opposing trends in loan demand. Thus, if seasonality is strong, it

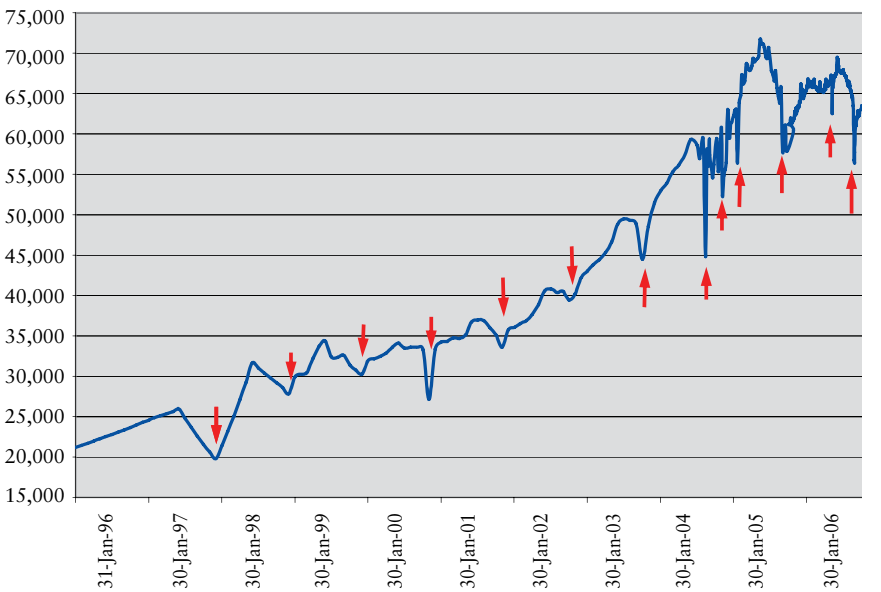
is likely to produce "double trouble"—high loan demand occurring at times of low deposit supply and vice versa.

The autocorrelation graphs yield another equally important and statistically significant result: all three deposit categories show strong serial dependency for short lags of one to three months. This simply means that if a particular month is above trend in deposit volumes, then the likelihood is large that the following two to three months also will be rather high, with a declining degree of certainty the further out one goes. High and low points in deposit supply tend to occur in clusters and are phased in gradually over several months. This result is more good news for liquidity management, because abrupt jumps from being drastically above trend to sharply below or vice versa are unlikely, making it much easier for the institution to cope with deposit supply variations.

3.7 CORE DEPOSIT TRENDS

As an initial step, the core deposit trend is determined based on local minima in the deposit balance time series as described in section 2.2 (2). The graph of the long-run actual savings balances (Figure 13) can be used to visually identify a series of significant minima or turnaround points in the deposit supply (identified by the arrows). Extracting the (date:value) pairs for the marked observations, a new regression curve can be calculated and fitted through just these minimal points. This is the core deposit growth trend.

Figure 13: Local Minima in Allied's Savings Deposit Supply Rs Millions



Note that the savings balances data in Figure 13 are the collation of all the monthly, weekly, and daily data points available. This explains why the graph looks smoother for the older history (monthly values) and more volatile for the recent data (weekly and daily balances). Table 5 lists the observed minimal turnaround values and the corresponding points on the regression trend line fitted through those points. The trend curve function is as follows: Trend = 0.156084 * 1.000331^ Datevalue

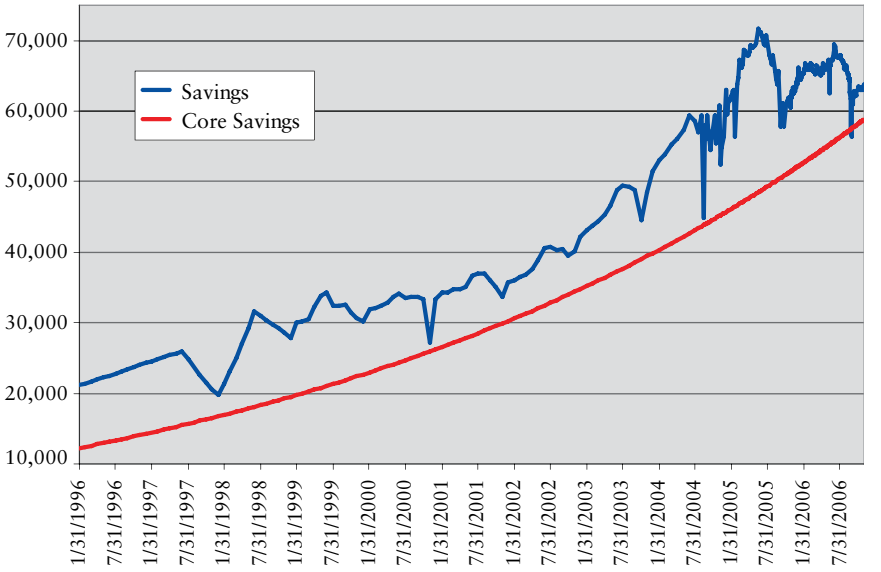
Table 5: Minimal Savings Supply and Calculated Trend Values Rs Million

MINIMAL SAVINGS SUPPLY POINTS

Date	Value	Trend
31-Dec-97	19,826	21,743
31-Dec-98	27,826	24,534
31-Dec-99	30,227	27,684
30-Nov-00	27,148	30,929
30-Nov-01	33,634	34,900
31-Oct-02	39,451	38,991
31-Oct-03	44,518	43,996
11-Sep-04	44,803	48,846
4-Dec-04	52,395	50,223
18-Feb-05	56,369	51,502
1-Oct-05	57,849	55,482
6-Jun-06	62,520	60,228
25-Sep-06	56,365	62,481

Figure 14 plots the actual observed values together with the core deposit curve based on the minimal points. The curve line shown has been corrected downward by subtracting an arbitrary safety margin of Rs 5 billion from all trend values. This provides a better fit of the curve, showing a support line that passes through or below the minima. The core savings trend can be interpreted as the stable bedrock of deposit supply that continues to revolve in the bank and can be deployed for long-term intermediation. The probability is low that the savings balances will ever fall below the support line.

Figure 14: Allied Bank Actual Savings Supply and Core Deposit Trend Curve
Rs Million



The support line would follow a much steeper growth trend but for the few brief but drastic dips in deposit supply (e.g., as on September 11, 2004; October 1, 2005; and September 25, 2006). There is a significant substitution effect going on around these low points from savings into current account balances within Allied Bank (as detailed in Section 3.9). This substitution provides a partial offset for the savings losses, and it shifts the combined core deposit trend to a higher level.

3.8 ANNUALIZED VOLATILITY

Returning to the essential question of deposit supply variability, the volatility measure mentioned in Section 2.2 (4) is applied to each of three product groups individually as well as to the aggregate supply from all three deposit products combined. The volatility is calculated in three steps:

1. For each of the daily data points from November 1, 2005, to November 28, 2005, the logarithmic daily "return" is calculated as $\ln(\text{balance}_{t+1}/\text{balance}_t)$.
2. The standard deviation is taken across all of the daily return observations.
3. The standard deviation is annualized by multiplying with the square root of 292 based on an average of 292 business days in a year.[7]

7 Typically, annualized volatility is calculated using 250 or 260 business days per year, but Allied Bank stays open most Saturdays as a regular business day.

The result is the annualized percentage standard deviation or volatility of the daily deposit supply (Table 6). Volatility is a dimensionless relative figure that can be compared among products of different overall magnitude and across institutions of different sizes. The result seems to confirm the intuitive expectation that small atomistic savings balances are more stable in the aggregate than larger term deposits—even though the latter are committed for fixed periods. Current accounts are even more volatile than either ordinary savings or term deposits. This is also in line with our general expectation, because current account balances are driven primarily by transaction requirements, and they are rarely held for long-term accumulation purposes.

Table 6: Annualized Volatility of Total Savings Balances, Current Accounts, and Term Deposits

STANDARD DEVIATION OF DAILY CHANGES			
Savings	**Current**	**Term**	**Total**
0.791%	2.393%	1.965%	1.106%
ANNUALIZED VOLATILITY			
Savings	**Current**	**Term**	**Total**
13.51%	40.89%	33.57%	18.90%

Using the assumption that the daily logarithmic relative changes in aggregate deposit supply are normally distributed, one can interpret the annualized standard deviation values as follows: with 68.2 percent probability, one can expect savings balances within one year from today to remain within 13.51 percent up or down from their one-year forward growth estimate. See the probability mass under a normal distribution as in Figure 15. With a probability of 95.4 percent (i.e., two standard deviations), the savings balances will remain within +/- 27.2 percent of their one-year forward growth estimate.

Figure 15: Normal Probability Distribution with Mean μ and Standard Deviation σ

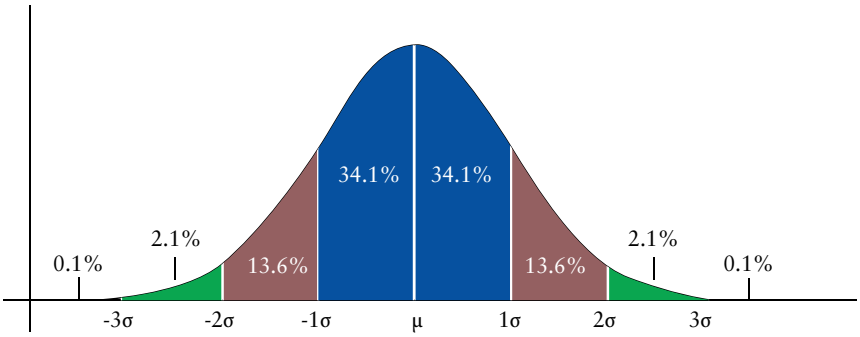
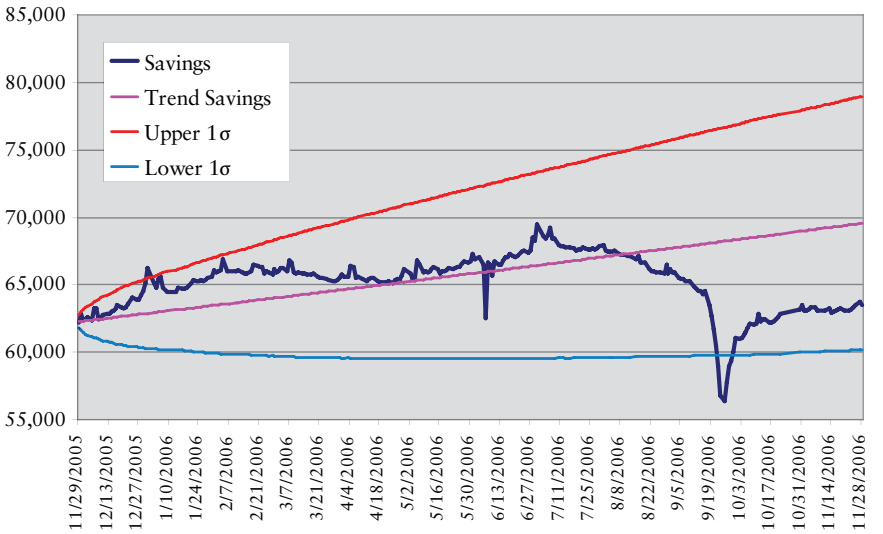


Figure 16 shows the annualized volatility of 13.51 percent for savings balances applied as a back test to the full year of actual savings observations from November 29, 2005, to November 28, 2006. This gives a 68.2 percent confidence interval draped around the pink trend line that expands with the square root of time and reaches +/- 13.51 percent by the end of the year.

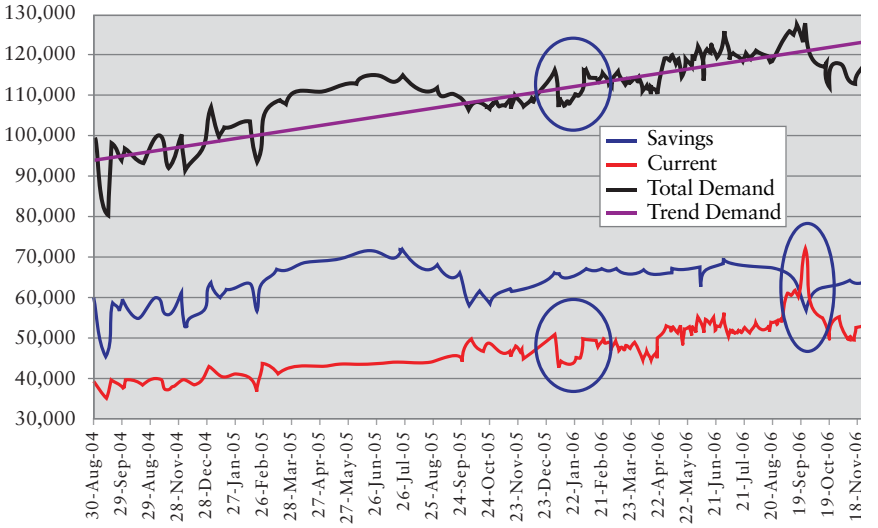
Figure 16: 1σ Confidence Intervals Around the Long-Run Savings Trend Line (Rs Million)



The actual observations for the savings balances pierce through the upper limit only once on December 31, 2005, and breach the lower limit for six days around September 25, 2006. This is seven days out of 292 or 2.4 percent—much less than the (1-0.682)*292=92 days outside of the 1σ confidence limit one might have expected on average.

From the perspective of liquidity management for the bank as a whole, it is the total daily deposit supply that counts, rather than the individual product balances. It would be interesting to explore potential offsets or co-movements between different product groups, in particular between the current accounts and the savings balances, which are both contractually available on demand. Possibly, the combined balances might be less volatile than either of the individual balances alone. Figure 17 shows a graph of the savings and current balances individually as well as the combined demand balances with their long-run trend curve. The graph covers the period from August 30, 2005, to November 28, 2006, for which the dataset has either weekly or daily data points.

Figure 17: Savings and Current Component Balances vs. Total Demand Deposit Supply (Rs Million)



There are some interesting compensation effects and reinforcing balance movements that become immediately apparent from the graph: the dip in savings balances in late September to early October 2006 seems to be very closely mirrored by a countermovement in the current account balances. A year earlier, at the end of September 2005, there is another drop in savings and a series of three mutually neutralizing undulations in savings and current account balances. Such off-setting patterns could give rise to a situation where the volatility of the total demand balance is smaller than for either of the individual product groups. However, there are also instances in the dataset where the balance movements in savings and current accounts reinforce rather than offset each other, such as in early September 2004 and in February 2005.

This picture is borne out in the volatility calculation on the daily time series for the combined total of current and savings accounts. Annualized volatility for total demand deposits comes out at 18.88 percent, which is higher than the 13.51 percent calculated on the savings balances alone, but which is less than the current accounts by themselves, which displayed a volatility of 40.89 percent p.a.

A compelling explanation offered by Allied Bank managers for the sharp declines of the savings balances in September 2004, 2005, and 2006 is the approaching month of Ramadan. The first days of Ramadan were October 13, 2004; October 2, 2005; and September 23, 2006. Regulations in Pakistan require that Allied Bank withhold a Zakat (charitable donation) deduction from all savings accounts at the time of Ramadan. Current

accounts are exempt from Zakat, however. In addition to withdrawals to cover Ramadan expenses and festivities, there is a known trend that savers withdraw balances from savings accounts ahead of Ramadan to avoid mandatory Zakat payment and redeposit the funds shortly afterwards. Many savers avoid the official Zakat in order to make cash donations to specific charitable causes of their own choice. Savers who have a parallel current account with Allied Bank will often simply move funds from the savings account to the current account to avoid Zakat. Those who do not have a current account often hold the funds in bankers checks.

3.9 AVERAGE LIFE OF DEPOSIT ACCOUNTS

When the simple average life calculation, as described in Section 2.2 (5), is applied to the most recent two years of weekly and daily product balances at Allied Bank, this calculation gives average daily lives for savings accounts, current accounts, and term deposits (Table 7).

Table 7: Days Average Life per Product Group

DAYS AVERAGE LIFE OVER 2-YEAR PERIOD		
Savings	**Current Accounts**	**Term Deposits**
322	245	218

The results show the average number of days that each 1 rupee layer in the total balance profile was present during the two-year observation period. The savings balances thus display an average life of 322 days, compared to 245 days for current accounts and 216 days for term deposits.

In essence, this average life measure is an alternative volatility calculation. The more variable the daily balances are, the higher the maximum balance attained relative to the average balances will be, and hence the shorter the average life of the deposit supply. As explained in Section 2.2 (5), average life is calculated as follows:

$$\textbf{Average Life} = \frac{\textbf{Rupee*Days}}{\textbf{maximum balance attained over the observation period}}$$

This average life calculation has an obvious limitation in the context of deposit balances that are subject to a general growth trend. The more recent and higher values tend to push up the maximum limit upon which the calculation is standardized, and this effect shortens the resulting average life. There is some intuitive sense in this, because the new balances have had only a short life on the books by the cut-off date and thus depress the average. In

reality, however, the newly mobilized balances might have the same expected life as the balances already present at the start of the measurement period.

Despite the limitations of the average life measure, the result sounds reasonable: the aggregate savings balances have longer lives than transaction account balances and term deposits. Term deposits under this measure seem even shorter in average duration than the average rupee in a current account. This is where average life and the annualized daily volatility result differ, and we would give more credence to the conventional volatility measure.

3.10 PECULIAR PATTERNS, TREND BREAKS, AND OUTLIER VALUES

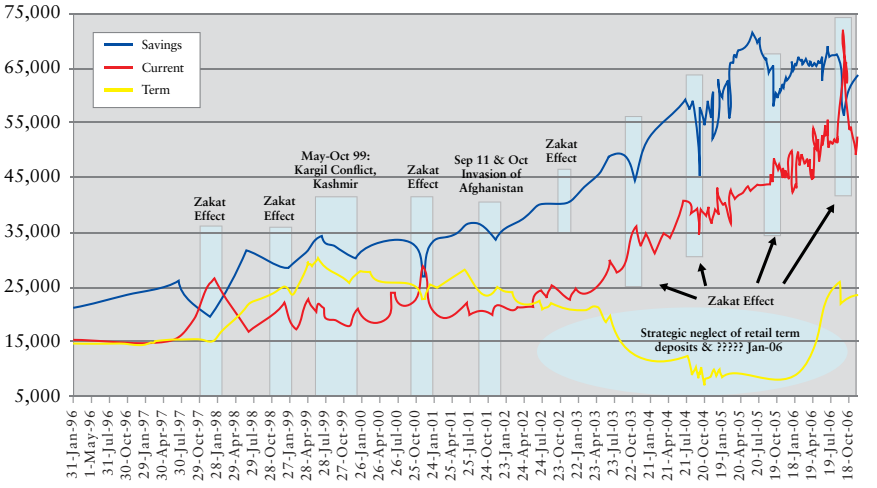
As a final step, we reviewed the overall deposit supply patterns, looking for yet unexplained movements, trend breaks, and outliers that require further explanation. We asked whether these movements might be linked to "events" as described in Section 3.4—external market factors or known political events that may have influenced customer behavior.

One obvious pattern is the savings deposit run-off before the start of the month of Ramadan, or Zakat effect. A Zakat effect can be made out in the savings balances every year, with the possible exception of the month of Ramadan starting on December 4, 1999, which overlapped with a longer lasting deposit run-off during the Kargil conflict, which began in May 1999 (Figure 18).

Aside from the Zakat effect, most of the political crises and natural disasters listed in Section 3.4 did not leave a visible dent in deposit supply. The Kashmir earthquake on October 8, 2005, for example, does not explain the drop in savings balances in early October 2005. This run-off had already started at the end of September 2005, and it represents yet another Zakat effect. If there had been a major rush to withdraw funds to cover emergency expenses relating to the earthquake, one would not expect to see current account balances rise while savings balances decline.

The terrorist attacks of September 11, 2001, and the U.S. military action in Afghanistan, which began October 7, 2001, did lead to an initial decline in balances of all three products. But toward the November 13, 2001, start of Ramadan, this trend becomes entwined with another Zakat effect, where current account balances tick up while savings balances dip further.

Figure 18: Savings, Current Account, and Term Deposit Supply vs. Known Events (Rs Million)



Overall, the supply of savings and current account balances appears quite resilient against external political shocks and natural disasters, as well as against the poor reputation issues during the difficult period for Allied Bank from 1999 through 2003 before recapitalization.

Reviewing potential supply-relevant events in light of the data in Figure 18, it becomes clear that one cannot easily detect positive, confidence-inspiring events in a simple chart. Negative events can have very prompt time-specific balance consequences, but positive news works more slowly, showing a gradual shift of the growth curve. Allied Bank's recapitalization and stock market listing certainly improved the brand image and perception of stability, but one would not reasonably expect a line of depositors to form in front of Allied Bank's branches on the day of the stock market launch. Indeed, the period of late August and early September 2004, just after the recapitalization and sale of Allied Bank, coincides with the steepest single drop in savings balances during the entire 11 years of data. This is likely a coincidence that is better explained by the seasonal Zakat effect, but it does support the point that good news does not tend to trigger abrupt movements in balances, while bad news may.

Finally, the gradual decline of term deposits between July 2003 and December 2005 deserves comment. Allied Bank explained to us that management purposely deemphasized the term deposit offering as a way to manage cost of funds at a time when ordinary savings supply growth was fully sufficient to meet loan demand and other funding requirements. With the accelerating credit expansion in 2005 and 2006, Allied Bank relaunched several attractive retail term deposit products in mid-January 2006 as a way to build up its funding mix. Foreign currency term deposits proved particularly popular and shot up from Rs 275 million in February 2006 to Rs 1,499 million by June 2006.

4 VTB, Georgia

4.1 BANK PROFILE

VTB Georgia, formerly United Georgian Bank, was formed in 1995 as a result of a merger between the Georgian affiliates of three former state-owned Soviet banks: Savings Bank, Eximbank, and Industrial Bank. In January 2005, the Russian Vneshtorgbank (Foreign Trade Bank) or VTB purchased 50 percent plus one share of United Georgian Bank for approximately US$7 million. In April 2006, VTB Russia increased its stake in United Georgian Bank to 53.13 percent in the context of an US$11 million capital increase. The bank was subsequently renamed VTB Georgia, but it continues to operate as a standalone subsidiary in the Georgian market.

With total assets of US$275 million (GEL 470 million) as of December 2006, VTB Georgia ranks as the third largest institution in the country. It has a market share of 15.6 percent of all loan assets in the Georgian banking system and holds 8.7 percent of all retail deposits (Table 8).

Table 8: Market Share of the Six Largest Banks in Georgia, % of Total Banking System

		% of Banking System				
Market Share of Six Largest Banks in Georgia		Total Assets	Loan Portfolio	Total Liabilities	Deposits	Deposits of Individuals
1	TBC Bank JSC	24.2%	24.7%	25.3%	25.2%	30.7%
2	Bank of Georgia JSC	22.3%	22.5%	22.5%	23.3%	23.2%
3	VTB Georgia	13.7%	15.6%	14.8%	16.3%	8.7%
4	Procredit Bank JSC	12.1%	12.8%	12.6%	9.8%	17.0%
5	Republic Bank JSC	8.8%	7.5%	9.1%	11.4%	10.3%
6	Cartu Bank JSC	7.5%	8.0%	5.9%	3.6%	3.1%

VTB Georgia has 18 branches throughout the country. It trades as a universal bank, providing a complete range of financial services, including savings; consumer, business, and housing loans; credit cards; transmission services; foreign trade finance; and so forth. Its franchise covers a cross-section of the Georgian economy, with balanced proportions of corporate, small and medium enterprises, and consumer clients.

With its traditional background as a business bank, VTB Georgia's market share of retail deposits is smaller than its overall rank in the banking system would suggest. However, the bank realizes the importance of a broad retail deposit base as a source of funding its asset growth. VTB Georgia recently ran several aggressive marketing campaigns for retail deposits from individuals, which is seen as a critical growth segment.

Retail deposits from individuals—as opposed to incorporated entities—now amount to 58 percent of all nonbank deposits. Total nonbank customer deposits as of year-end 2006 amounted to US$77.5 million (GEL 132.8 million) or 28.3 percent of total balance sheet size. The time series data provided by VTB Georgia are based on retail savings and term deposits (not current accounts) from resident individuals and cover 45 percent (GEL 58.8 million) of all nonbank customer deposits as of December 31, 2005.

Georgia is a partially dollarized economy where most current payments between residents are carried out in the Georgian Lari, but transactions in high-value items and most long-term savings and investing activities are anchored in foreign currency. In Georgia, the dominant foreign reference currency is the U.S. dollar. Hence, two-thirds of demand savings deposits at VTB Georgia and 98 percent of term deposits are denominated in foreign currency (mostly in U.S. dollars, with a small proportion in Euros). The savings products offered to individual retail clients are conventional demand savings accounts, some of them branded specifically for children; term deposits with specified maturity; and savings plans with fixed monthly installments. There are no minimum balance requirements for opening an account, but interest rates are staggered by balance layers and reach up to 4 percent on ordinary GEL savings accounts and 12 percent for GEL term deposits committed to one year or more. All deposit products are available in GEL, U.S. dollar, and Euro denominations. Table 9 shows the number of accounts, average account sizes, and average balances for retail deposits held by individuals during 2005 for the three major currencies.

Table 9: Average Account Sizes, Number of Accounts, and Average Total Balance Supply in 2005 (Balances in Respective Currency Units)

AVERAGE ACCOUNT SIZES

Demand Savings			Term Deposits		
USD	EUR	GEL	USD	EUR	GEL
1,323	446	15	11,039	13,650	2,797

NUMBER OF INDIVIDUAL ACCOUNTS

Demand Savings			Term Deposits		
USD	EUR	GEL	USD	EUR	GEL
4,429	625	271,559	2,172	189	236

AVERAGE TOTAL BALANCE SUPPLY

Demand Savings			Term Deposits		
USD	EUR	GEL	USD	EUR	GEL
5,543,358	248,312	4,075,369	21,883,290	2,276,297	584,010

4.2 REGULATORY CONTEXT

The activities of commercial banks in Georgia are regulated by the National Bank of Georgia. The National Bank has implemented a typical Basel I capital adequacy framework with additional capital requirements for market risk from open foreign exchange positions and for currency-induced credit risk.[8] The National Bank requires banks to hold 8 percent tier 1 capital against their credit risk-weighted assets and against their net open foreign exchange position. Total tier 1 plus tier 2 capital must be at least 12 percent of risk-weighted assets and the open foreign exchange position combined.

Banks also must maintain statutory liquid asset requirements and observe typical prudential limits on credit concentration, large single exposures, connected party loans, and uncollateralized exposures. Deposit liabilities in local and foreign currency are subject to a very high reserve requirement of 13 percent.

Since 2000, Georgia has seen remarkable exchange rate stability, low inflation, and sustainable economic growth. Exchange rates against the U.S. dollar have even modestly appreciated recently. However, the economy is exposed to disruptions in its fragile trade relationship with Russia, and it remains vulnerable due to its dependency on foreign investment, remittances,

8 Currency-induced credit risk arises from borrowers who are indebted in foreign currency but primarily rely on local currency-denominated assets and cash flows to service the debt. These borrowers are particularly vulnerable in a sudden devaluation of the local currency. Georgia requires banks to apply a 200 percent credit risk weight in the capital adequacy calculation of foreign currency-denominated loans to the private sector.

and the high degree of dollarization—hence, the high liquidity requirements and the prudential emphasis on foreign exchange risk exposures.

4.3 INCOME CONTEXT

Per capita GNI in Georgia for 2005 stood at US$1,320 (Atlas) and US$3,270 (PPP). For comparison, the average for high-income countries is US$35,131 (Atlas) and US$32,524 (PPP). In 2003, 54.5 percent of the Georgian population lived below the national poverty line, with 25.3 percent living on less than US$2 a day and 6.5 percent living on less than US$1.[9] These statistics mark Georgia as a poor transition economy, and they qualify it for being part of this study.

4.4 COUNTRY BACKGROUND AND STRESS EVENTS

Georgia has been an independent country since the dissolution of the Soviet Union in 1991. It remains a relatively fragile transition economy with a number of unresolved issues that continue to create instability and recurring crises. A wave of nationalism after separation from the Soviet Union led to a separatist backlash in the Georgian regions of Abkhazia and South Ossetia. Military attempts to restrain the breakaway territories failed in the 1990s. Abkhazia and South Ossetia remain outside the control of the Georgian government. They are ruled by unrecognized de facto governments supported by Russia. Russian-led peacekeeping operations continue in both regions. Although in a fragile balance recently, these unresolved conflicts could easily flare up and trigger a crisis of confidence at any time.

Two specific periods of recent political turbulence that may have impacted economic confidence and depositor behavior stand out:

- **Rose Revolution (November 2003 to January 2004):** An attempt by the incumbent Georgian government to manipulate national legislative elections in November 2003 touched off widespread protests that led to the resignation of Eduard Shevardnadze, president since 1995. New elections in January 2004 swept Mikheil Saakashvili along with his National Movement party into power with 96.3 percent of the vote.
- **Energy crisis (January 2006):** Georgia conflicted with Russia over the price of gas supplies, and pipeline explosions on January 22, 2006, brought Georgia to a standstill during the coldest period of the year.

9 World Development Indicators database, July 1, 2006, www.worldbank.org.

4.5 BANK ELIGIBILITY

The average balance numbers (Figure 19) compared to per capita GNI give some indication that demand savings products for individuals at VTB are not exclusively targeted to a narrow rich elite.

The demand savings products, and in particular the many small GEL savings accounts, appear to be reasonably representative of the low-income, small balance saver that this study targets. Contrasting the behavior of these accounts with the larger term-deposit accounts might give some insights into the suspected differences in volatility of small- versus large-balance accounts.

4.6 LONG-TERM TRENDS AND SEASONAL PATTERNS

Figures 19 and 20 depict the long-run time series of aggregate volumes by product and account.

Figure 19: Long-Run Time Series of Aggregate Demand Deposit Supply from Retail Accounts (January 2001–September 2006)

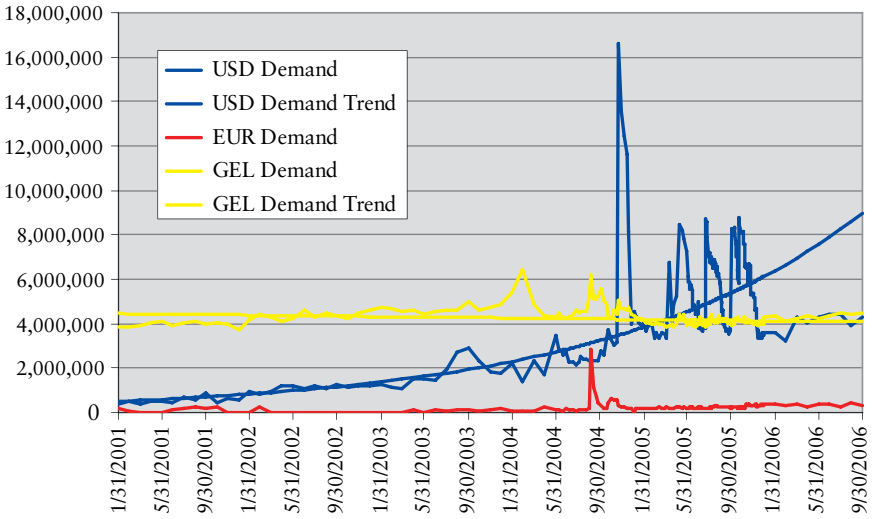
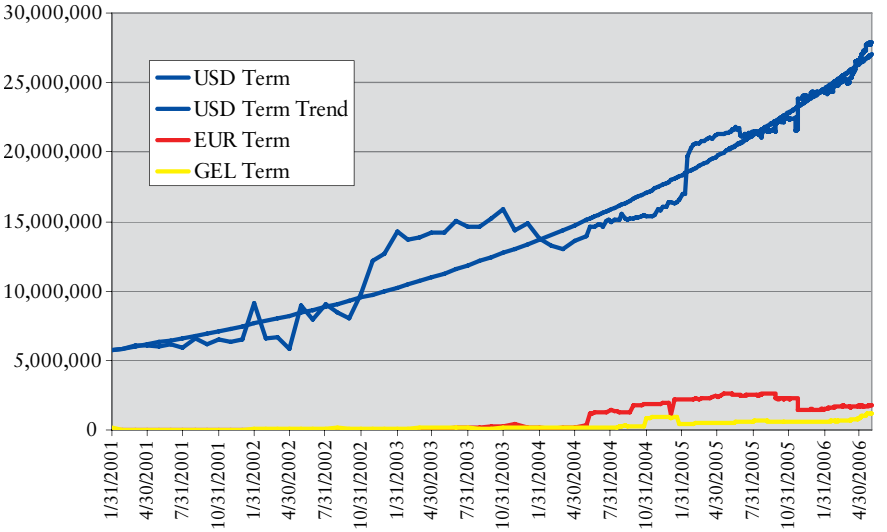


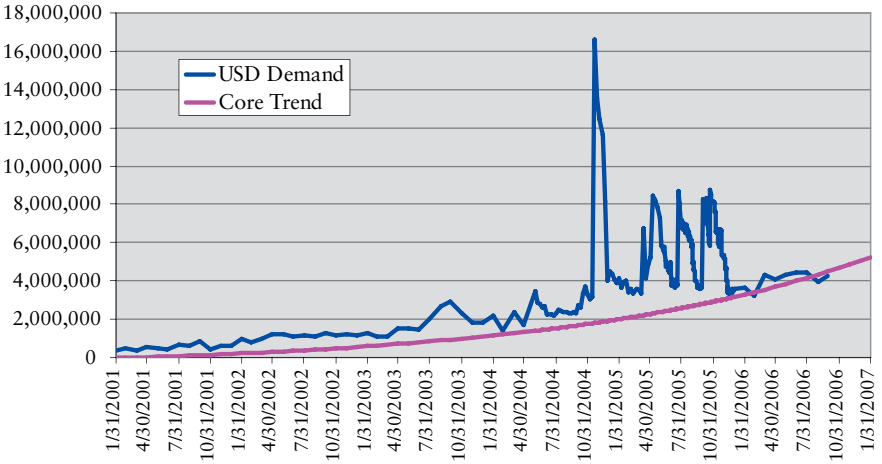
Figure 20: Long-Run Time Series of Aggregate Term Deposit Supply from Retail Accounts (January 2001–May 2006)



On the demand deposit side, there is a stable (but rather stagnant) supply of GEL-denominated deposits and a growing (but highly volatile) amount of U.S. dollar-denominated deposits. Euro-denominated deposits are quite insignificant both in term and demand deposit operations. Term deposits are primarily U.S. dollar-denominated accounts that appear to follow a steady exponential growth trend.

On the highly volatile U.S. dollar demand deposits, it might be of interest to determine the core deposit trend by analyzing local minima, as described in Section 2.2 (2). An exponential regression curve is fitted through the temporary minimum points in the supply of U.S. dollar demand deposits to produce a core trend line (Figure 21).

Figure 21: U.S. Dollar Demand Deposit Actuals and Estimated Core Deposit Trend Line

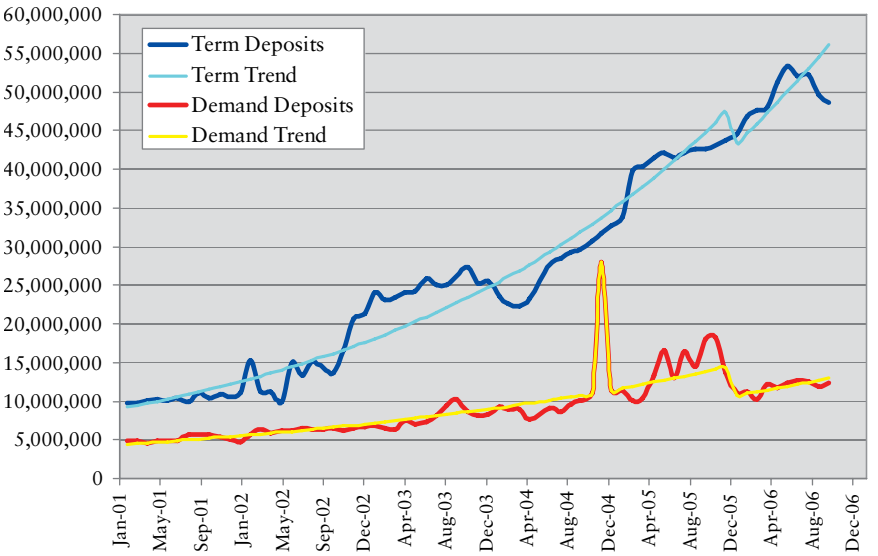


This core deposit trend can be interpreted as the lower support line—below which the aggregate U.S. dollar demand deposit volume is unlikely to fall. Extending this trend line for four months beyond the last actual observations illustrates the use in forecasting core deposit supply. Given this trend, VTB Georgia would be relatively safe to assume that the resources provided by these core U.S. dollar demand deposits can be used to fund longer term assets.

Next, the data are examined for evidence of annual seasonal effects that influence deposit supply. This step is performed on the total deposit balances across all three currencies for both demand and term deposits using month-end data from January 2001 through September 2006. As in the case of Allied Bank, the general logarithmic trend calculations are adjusted using dummy variables that control for outliers and trend breaks caused by external events. The need for such a trend correction is most obvious on the time series of total demand deposits (Figure 22). Based on interviews with bank personnel, the radical outlier value at the end of November 2004 is most likely the result of a single atypical transaction that should not influence the expectation of the underlying long-term trends. The outlier is neutralized with a special dummy variable equal to 1 on November 29, 2004, and 0 otherwise. The yellow trend line (Figure 22) therefore coincides with the red line of actual observations for the end-of-November spike, thus hiding the red line behind it. A second correction is made to control for the lower demand deposit mobilization following the stand-off with Russia over energy supplies beginning in December 2005 through the end of the data series in September 2006. This provides a clearly better fit of the trend for

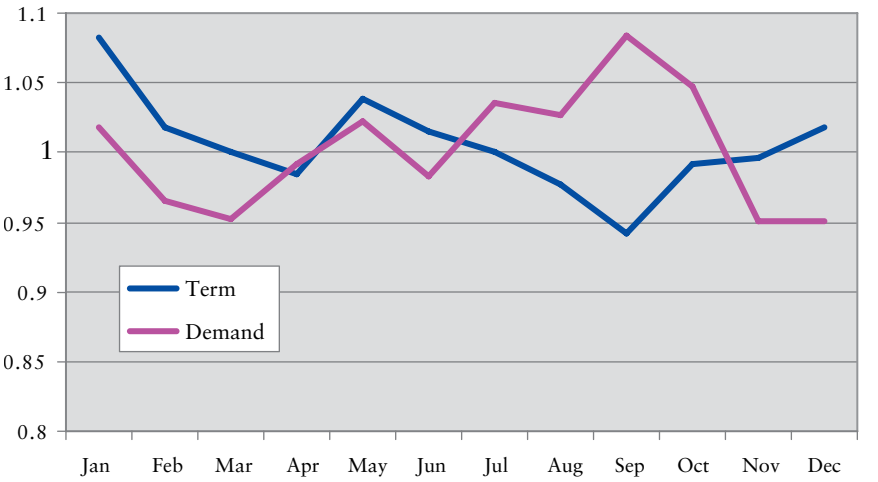
demand deposits. For consistency, the same "Russian energy crisis" dummy variable is applied to the term deposit side as well, although the trend break in the observations is less obvious here.

Figure 22: U.S. Dollar Demand Deposit Actuals and Estimated Core Deposit Trend Line



Based on actual monthly observations and adjusted trend values, an average seasonal index (actual / trend) is calculated (Figure 23).

Figure 23: Average Seasonal Index Values for Total Demand and Total Term Savings Deposits



The graph seems to indicate a strong seasonal supply of demand deposits toward the fall. On average over the last six years, September balances in demand deposits were 108 percent of trend, while December balances were only 95 percent of trend. Term deposits, on the other hand, tend to be high toward the end of the year and peak in January at 108 percent, before dropping to a seasonal low in September of 94 percent. The amplitude of the average seasonal variations from the trend is rather small—comparable to the observations at Allied Bank. For September, where opposing extremes for term and demand deposits are calculated, one can even expect some offset between the two deposit products. This would further reduce the impact of any seasonal influence on aggregate deposit supply.

The perception of relatively low exposure to seasonal effects also bears out in very low autocorrelation results calculated on the monthly (actual / adjusted trend) time series for demand and term deposits (Figures 24 and 25). Based on these calculations, one would have to conclude that there are no statistically significant seasonal cycles at work in VTB Georgia's deposit supply (either in the term or the demand deposit side).

Figure 24: Correlogram for Actual/Trend Demand Deposit Time Series

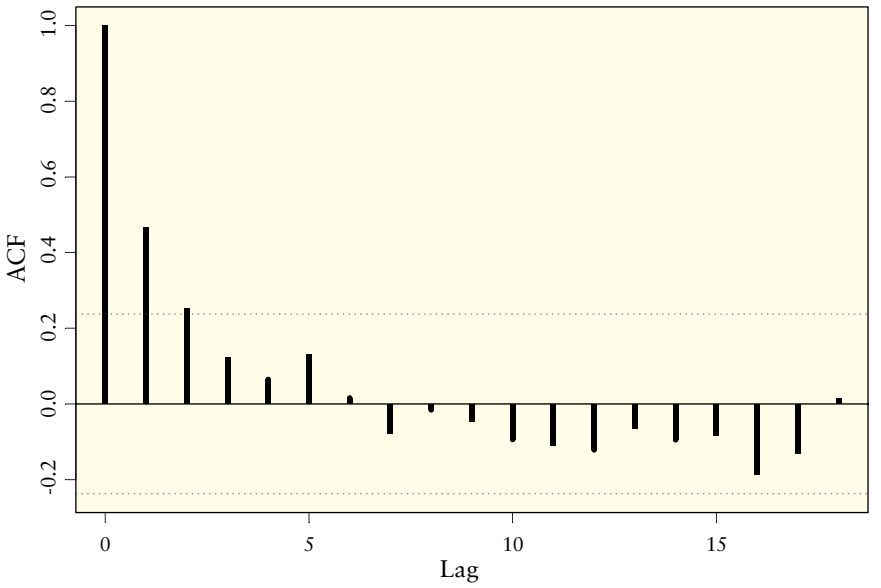
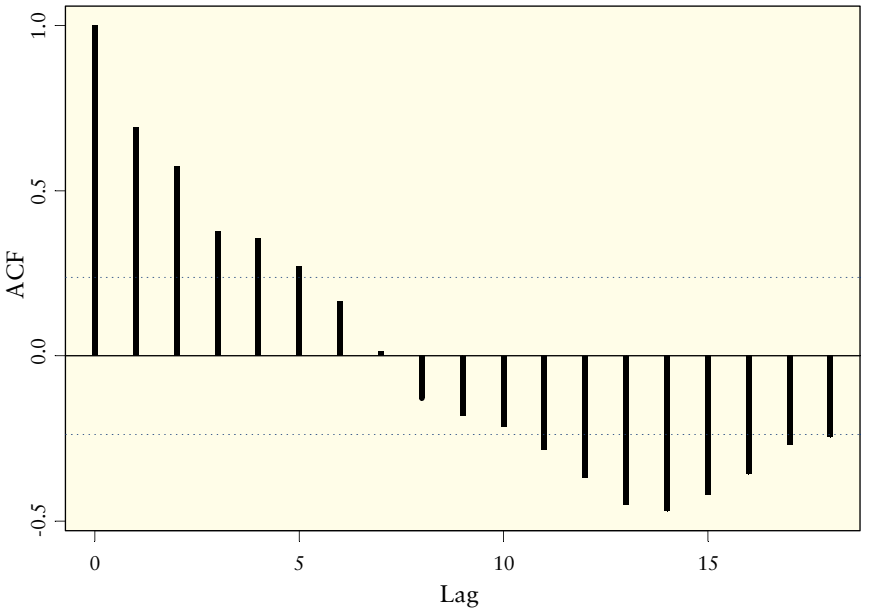


Figure 25: Correlogram for Actual/Trend Term Deposit Time Series



4.7 ANNUALIZED VOLATILITY

Next, the daily time series for demand and term deposits from May 30, 2005, to May 30, 2006, are used to calculate an annualized volatility measure (Table 10). Unfortunately, the values from January 2006 onwards for demand deposits could not be included because there is an obvious break in the data as of year end that can be explained only by a change in the filter settings that were used to extract the data. For term deposits, however, the entire time series through May 2006 is usable.

Table 10: Volatilities for Demand and Term Deposits Based on Daily Observations

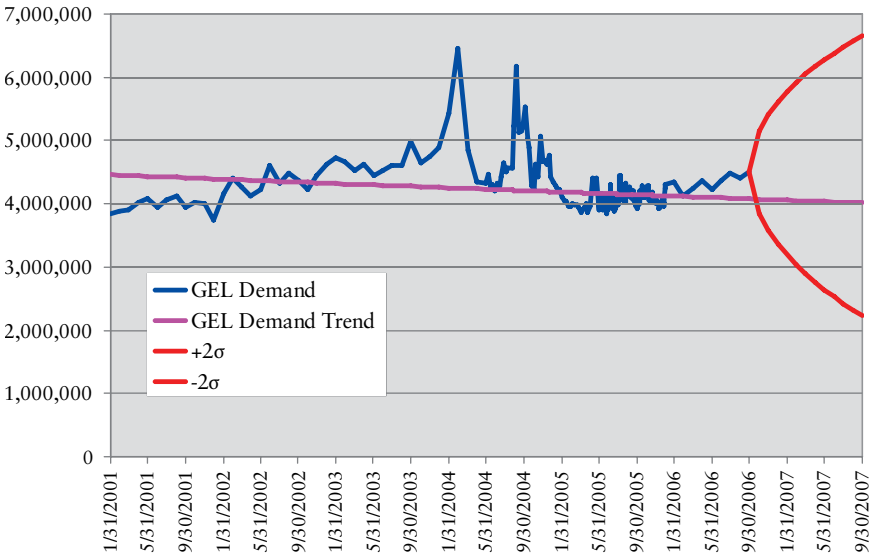
ANNUALIZED DAILY VOLATILITIES FOR DEMAND AND TERM DEPOSITS BY CURRENCY							
USD Demand	EUR Demand	GEL Demand	Total Demand	USD Demand	EUR Demand	GEL Demand	Total Term
152.23%	114.31%	27.60%	103.82%	10.10%	41.02%	23.12%	6.73%

The annualized volatility measures seem to confirm the impression from the visual inspection of figures 19 and 20: U.S. dollar demand deposits are very volatile, while GEL demand deposits are quite stable and can be expected to move up or down only by 27.6 percent over a one-year time

horizon. Contrary to expectations, term deposits display rather small volatility, particularly in the predominant category of U.S. dollar accounts. Interestingly, there seems to be some compensatory effects between the U.S. dollar term deposits and the small numbers of Euro and GEL term deposits, such that the volatility of the total term deposit supply is lower than for any of the individual currencies.[10]

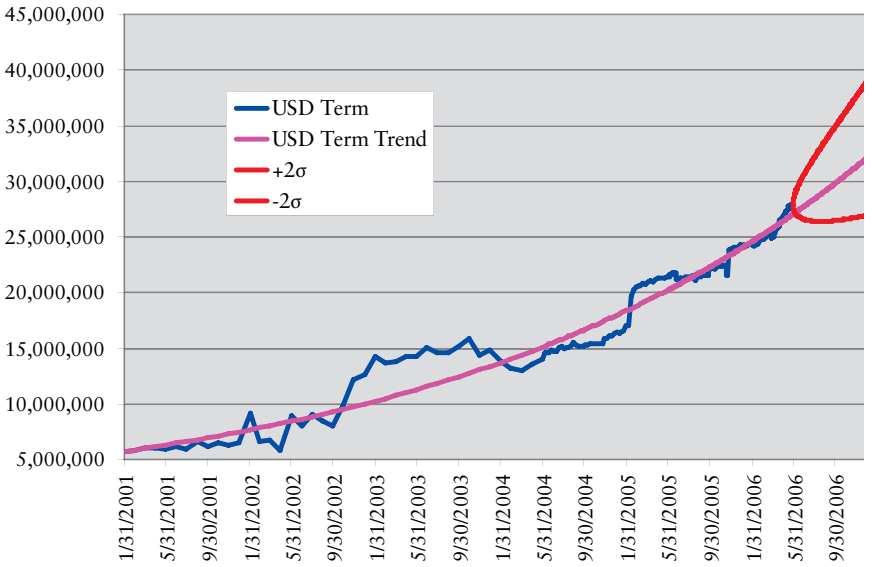
If one assumes that the daily variations of aggregate deposit balances around their exponential trend line are normally distributed, one can use the volatility results to construct confidence intervals that are a useful tool in forecasting deposit supply and determining the proportion of stable core deposits. Figures 26 and 27 show such forward confidence intervals for GEL demand deposits and U.S. dollar term deposits, each with a confidence level of 95.4 percent (i.e., a range of two standard deviations). The red lines marked +/- 2σ limit the forward confidence interval of deposit supply. This means for U.S. dollar term deposits, for example, that there is only 4.6 percent chance of realizing a lower or higher deposit volume outside of the confidence interval, given that the volatility and trends observed in the past continue to drive the behavior of aggregate balances. The area below the -2σ line is yet another measure of core deposits. There is a probability of only 2.3 percent each day that the bank may see total deposits in this product below the lower red line.

Figure 26: GEL Demand Deposits, Actual Values, Trend, and 95.4% Forward Confidence Interval



10 Note that we held steady the exchange rates among Euro, U.S. dollar, and GEL used to calculate daily total deposits for the entire observation, to avoid confusion between balance movements and exchange rate effects.

Figure 27: U.S. Dollar Term Deposits, Actual Values, Trend, and 95.4% Forward Confidence Interval



4.8 AVERAGE LIFE OF DEPOSIT ACCOUNTS

Average life is calculated using two years of weekly and daily total demand and term deposit product balances from January 2004 to December 2005 (Table 11).

Table 11: Days Average Life per Product Group over the January 2004 to December 2005 Observation Period

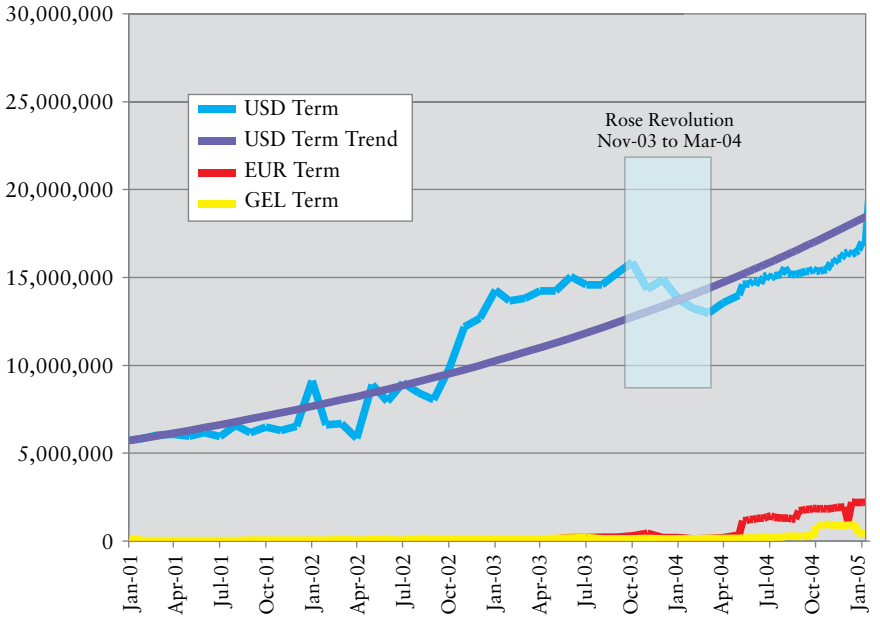
AVERAGE LIFE IN DAYS	
Total Demand Deposits	Total Term Deposits
259	538

For each dollar or Lari in the peak balance, the average time present in the accounts was either 259 or 538 days over a total 730 days in the observation period. The more volatile the balance is, the shorter the average life of each currency unit is.

4.9 PECULIAR PATTERNS, TREND BREAKS, AND OUTLIER VALUES

As with Allied Bank, the research team attempted to map the stress events described in Section 4.3 to the balance developments in the various retail deposit products or their totals. The only clear balance trend that seems to coincide with one of the candidate events is the marked decline in U.S. dollar term deposits during the Rose Revolution and the transition from the Shevardnadze to the Saakashvili presidency (Figure 28).

Figure 28: Mapping of Political Events to Balance Developments

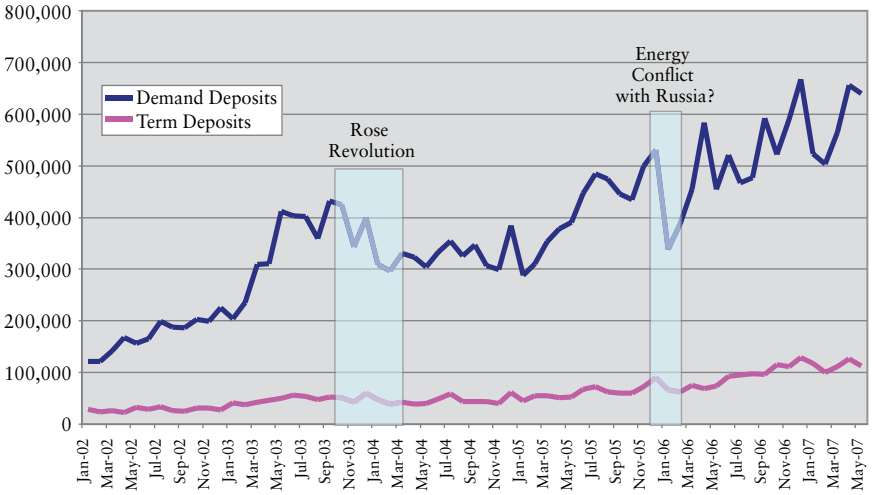


Although it is difficult to distinguish coincidence and causality, it appears plausible to suppose a strong preference for holding physical cash instead of book money during turbulent political times, particularly in hard foreign currency.

The National Bank of Georgia publishes a statistic of deposits held by individuals with all commercial banks in Georgia. Figure 29 charts the foreign currency-denominated total retail deposits in the banking system month by month. On GEL-denominated accounts, one would expect a high proportion of book money transactions between banks such that one bank's deposit loss is another bank's gain. However, when it comes to foreign currency savings held by private individuals, one can safely assume that the primary alternative to holding the funds in a commercial bank is

to hold it in physical currency at home. This practice should make "panic withdrawals" visible in the system-wide statistic, rather than canceling each other out across banks.

Figure 29: Mapping of Political Events to Banking System-Wide Foreign Currency Deposits Held by Individuals (GEL-equivalent millions). Source: National Bank of Georgia.



The assumption about a drop in deposits at VTB Georgia during the Rose Revolution appears to be supported by a corresponding decline in the system-wide demand deposit figures. One could even speculate that the sharp decline in foreign currency term and demand deposits during the energy crisis in late 2005 and early 2006 is related to the loss of confidence and fear of a further escalating conflict with Russia that led to hoarding physical currency. However, there is obviously a good measure of arbitrariness in retrofitting simple explanations to observed balance movements: there are more sharp balance drops than there are plausible, compact macro events with which to associate them.

5 BPR Kebomas, Indonesia

5.1 BANK PROFILE

Indonesia has a network of over 2,100 rural people's credit banks (bank perkreditan rakyats or BPRs) that offers a wide range of savings and loan products mostly to small farmers, fishermen, and artisans in the Indonesian countryside. BPR Kebomas in the town of Gresik in Jawa Timur has been in operation since the early 1990s. It was acquired in March 2006, and it is now managed by the large development NGO Bina Swadaya.[11]

As of June 2006, BPR Kebomas maintained a total balance sheet equivalent to US$641,000, of which US$554,000 was invested in small loans to community members. The largest source of funding for BPR Kebomas is ordinary savings and term deposits from members that amount to US$377,000, or 59 percent of total assets. The bank has been consistently profitable since 2002, earning an average of US$22,500 per year during the last three years. BPR Kebomas operates two small branches in Benjeng and Menganti in addition to its main office in Gresik.

BPR Kebomas offers nine different individual and group savings products, all of them denominated in Indonesian Rupiah (US$1 = Rp 9,100). Some accounts are branded for a specific purpose, such as education expenses or the Walisongo account, which is dedicated to paying for the pilgrimage to the Muslim holy site in Jawa. The Swadaya or KKM savings accounts are directly linked to credit accounts as pledged mandatory collateral. To the extent possible, this study does not include mandatory savings balances in its analysis.

5.2 REGULATORY CONTEXT

Bank perkreditan rakyat is actually a generic term that may refer to four different types of small financial institutions: so-called BKDs, LDKPs (lembaga dana dan kredit pedesaan), old style BPRs, and new style BPRs. The history and the services these institutions provide to their clients are different for each—some are deposit-taking only, others provide only credit, and some do both.

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11 See www.gdrc.org/icm/bina-swadaya.html or www.binaswadaya.org

New-style BPRs, such as BPR Kebomas, are licensed financial institutions, mostly privately owned, that meet the criteria specified in the 1992 Banking Act. They numbered 2,148 in 2004 and accounted for 15 percent of the microfinance market. Other generic BPRs number almost 9,000. These are unlicensed rural financial institutions, and they include the village-owned BKDs of Java and Madura as well as the LDKPs or rural fund and credit institutions, owned mostly by provincial governments or by village communities.

Licensed BPRs are regulated and supervised by Bank Indonesia. BPRs are allowed to accept deposits, but are limited in terms of location, function, and portfolio composition. BPRs operate on banking principles, offering loans, savings, and term deposits, but not checking accounts.

The 1992 Banking Act was revised in 1998, and deposit protection was made mandatory for all banks including licensed BPRs. As a departure from the traditional prescriptive prudential supervision, Bank Indonesia today follows a more qualitative risk-based supervisory approach that focuses on the individual financial institution's risk management capacities, policies, and procedures.

Bank Indonesia monitors the liquidity risk of financial institutions with a loan-to-deposit ratio and a liquid-assets-coverage ratio that compares liquid assets to current liabilities. A target ratio of 95 percent net loans to deposits is considered sound for small banks. In July 2004, Bank Indonesia introduced minimum reserve requirements as an additional measure to increase liquidity in the banking system and control credit expansion. Bank Indonesia actively promotes alternative funding mechanisms for BPRs through linkages with the commercial banking sector and envisages the establishment of funding pools in the BPR sector.

5.3 INCOME CONTEXT

Indonesia is a relatively poor developing nation with GNI per capita of US$1,280 (Atlas) or US$3,720 (PPP). This places Indonesia at 139 in the global GNI league table. A 1999 survey showed 27.1 percent of Indonesians living below the national poverty line. According to the World Bank World Development Indicators database, 52.4 percent live on less than US$2 per day, and 7.5 percent on less than US$1 per day. BPR Kebomas' group savings methodology for ordinary savings accounts specifically targets such poor to low-income clients.

5.4 COUNTRY BACKGROUND AND STRESS EVENTS

Since 1998, Indonesia has been transitioning from an authoritarian regime to a democratic government. After the long-term leader Suharto fell from power, the first free parliamentary elections were held in June 1999. The elected president and Muslim leader Abdurrahman Wahid was dismissed in July 2001 in favor of his vice-president Magawati Sukarnoputri.

When this study was conducted, most recent presidential elections were held on July 5 and September 20, 2004. In the second round, former security minister Susilo Bambang Yudhoyono defeated incumbent President Megawati. Yudhoyono was inaugurated on October 20, 2005. Each of these elections created massive civil disturbances and unrest that could have impacted depositor confidence and might have led to a preference for physical cash holdings, thus reducing deposit balances at BPR Kebomas.

In addition to the turbulent political transitions, Indonesia struggled with separatist movements in several provinces, including the most violent and publicized situation in East Timor, which was formally split off from Indonesia in 1999. Economically, Indonesia suffered significantly from the Asian financial crisis in 1997–1998. Further external shocks include terrorist attacks that began in 2002 in Bali and the tsunami in December 2004.

5.5 BANK ELIGIBILITY

Table 12 summarizes the total voluntary deposits at BPR Kebomas into two broad categories: (*i*) ordinary demand savings accounts that are often held for groups of very small savers and (*ii*) larger term-deposit accounts. Although balances supplied by ordinary savings accounts are growing, large term deposits held by a rather small number of wealthier clients still contribute more than three times the deposit volume of ordinary savings accounts. These small ordinary savings accounts at least appear to fit well with the definition of SBDs.

Table 12: Account Numbers and Average Balances per Account at BPR Kebomas (January 2005–June 2006)

Date	Ordinary Savings Accounts			Term Deposits		
	Total	No. of Accounts	Average Balance	Total	No. of Accounts	Average Balance
31-Jan-05	$35,643	533	$ 67	$217,361	82	$2,651
28-Feb-05	$37,621	566	$ 66	$228,488	84	$2,720
31-Mar-05	$39,369	589	$ 67	$229,997	85	$2,706
30-Apr-05	$55,624	592	$ 94	$240,863	68	$3,542
31-May-05	$57,764	610	$ 95	$230,394	56	$4,114
30-Jun-05	$51,009	615	$ 83	$250,368	62	$4,038
31-Jul-05	$56,397	619	$ 91	$251,866	64	$3,935
31-Aug-05	$51,415	617	$ 83	$260,683	85	$3,067
30-Sep-05	$54,988	639	$ 86	$278,907	85	$3,281
31-Oct-05	$56,625	655	$ 86	$237,886	81	$2,937
30-Nov-05	$65,768	677	$ 97	$275,940	56	$4,927
31-Dec-05	$75,658	724	$104	$285,741	61	$4,684
31-Jan-06	$67,035	718	$ 93	$278,715	64	$4,355
28-Feb-06	$69,000	766	$ 90	$272,244	66	$4,125
31-Mar-06	$69,165	760	$ 91	$292,915	75	$3,906
30-Apr-06	$75,770	789	$ 96	$291,875	73	$3,998
31-May-06	$79,025	790	$100	$300,101	77	$3,897
30-Jun-06	$88,089	820	$107	$288,959	84	$3,440

5.6 LONG-TERM TRENDS AND SEASONAL PATTERNS

Figure 30 provides a snapshot of the long-term deposit supply trend at BPR Kebomas. Term deposits followed a steep exponential growth path after 2002 but have tapered off since mid-2006. Ordinary savings balances closely track a more modest growth trend.

Figure 30: Actuals and Long-Term Trend Lines for Aggregate Ordinary Savings and Term Deposits at BPR Kebomas, Indonesian Rupiah

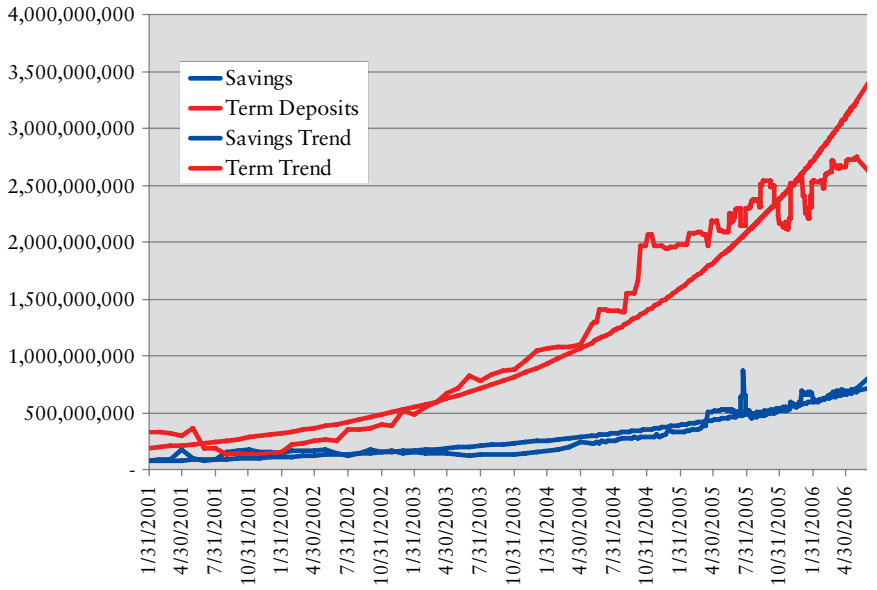
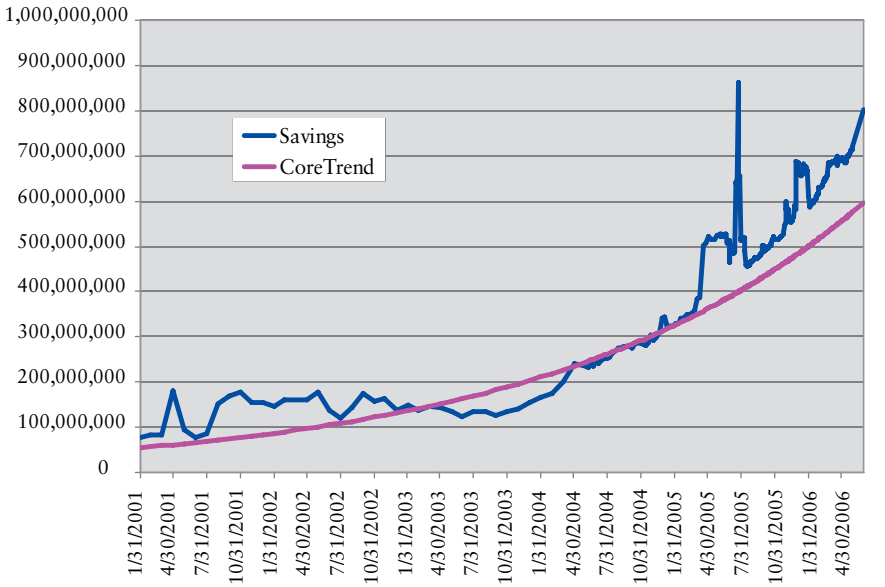


Figure 30 represents a combination of all data points in month-end, weekly, and daily time series obtained from BPR Kebomas. June 2004 to June 2006 appears more volatile only because of the availability of weekly and daily data points; data before this period includes only month-end data points. The graph suggests that ordinary savings balances, although much smaller in total, are less volatile than the term deposit supply. This may make them particularly useful as core deposits that can be counted on for long-term uses.

As with the other banks in this study, Figure 31 analyzes core deposits raised from ordinary savings accounts based on a trend line fitted through local minima in the time series.

Figure 31: Actuals and Core Deposit Trend Aggregate Ordinary Savings Deposits (Rupiah)

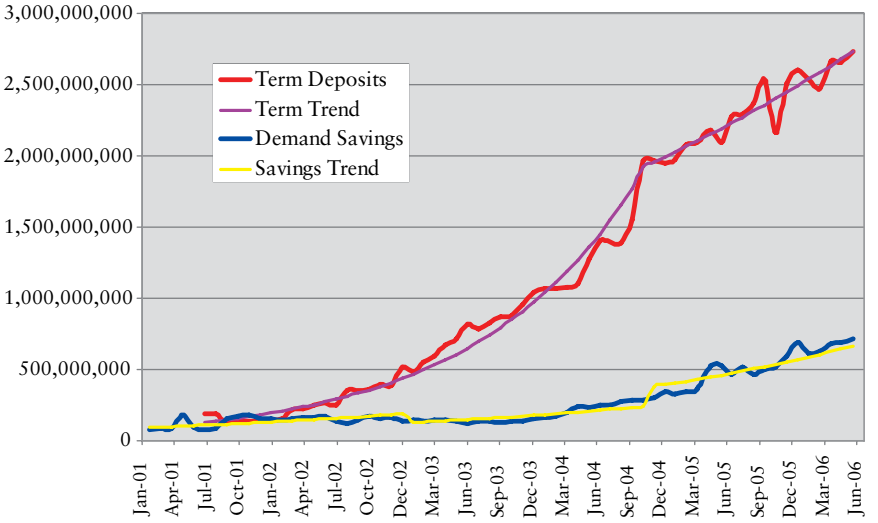


Next, annual seasonal cycles are sought in the long-run monthly deposit figures from January 2001 to June 2006. As with the other banks in this study, trend adjustments are necessary to improve the fit with actual observations and avoid bias from outlier values and obvious trend breaks.

In the case of term deposits, Figure 30 seems to indicate a shift to a flatter growth trend from October 2004 onward. We also opted to suppress the relatively high term deposit values from January through May 2001, which can be regarded as a false start that has little relevance for the more recent behavior of term deposits. With these two corrections, a new trend line for term deposits (in pink, Figure 32) shows a kink in the growth trajectory at the trend break point of October 2004.

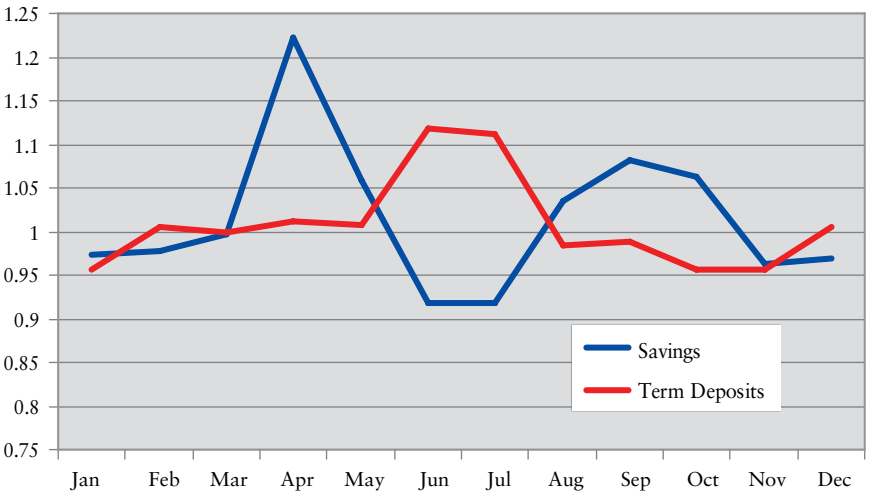
For demand savings, using a monthly time series for the seasonal analysis already suppresses the notable outlier value on July 22, 2005, which stood out in Figure 31, but falls between the month-end data points in Figure 32. One further dummy variable is introduced to control for the consistent below-trend performance of demand savings during January 2003–October 2004. With these corrections, the monthly actual versus long-run trend chart (Figure 32) are obtained.

Figure 32: Actuals and Adjusted Trend Lines for Ordinary Savings and Term Deposits (in Rupiah)



The data depicted in Figure 32 are used to calculate seasonal index values as relative deviations from the trend (Actual/Trend) for each month and average these indexes over 2001–2006. This gives average seasonal indexes (Figure 33).

Figure 33: Average Seasonal Index Values (Actual/Trend) for Ordinary Savings and Term Deposits



For ordinary savings deposits, the graph indicates a strong seasonal peak in April and a second weaker one in September, with seasonal low points in June and July. Term deposits appear to reach an offsetting maximum in June and July, while conforming closely to the trend during the rest of the year.

The strong April peak on ordinary savings balances should be interpreted with caution, however. The value is heavily influenced by the very first April observation (April 2001) in the data, which was 178 percent of trend but on overall very small volumes. Without the April 2001 outlier, the average for April would be only 111 percent of trend. To reduce the impact of some early aberrations, one might consider weighting the seasonal index values in the average by giving greater importance to more recent observations. On the term deposit side, the seasonal high in June is also heavily influenced by the first observations in June and July 2001, which are 147 percent and 140 percent, respectively. Suppressing these first values would make June and July come out only 2.8 percent and 4.5 percent, respectively, above trend on average. Thus one should not place much trust in the statistical significance and predictive value of the seasonal patterns shown in Figure 33.

These doubts are confirmed by an autocorrelation analysis performed on the (actual / adjusted trend) time series. Based on figures 34 and 35, one should reject the hypotheses that there is significant seasonality for ordinary savings and term deposits at BPR Kebomas. Beyond the immediate short cycle echo (i.e., if one month is above trend then it is likely that the following month is also high), the determination levels for longer lags all fall below the significance threshold (dotted line).

Figure 34: Correlogram for Actual/Trend Time Series on Ordinary Savings

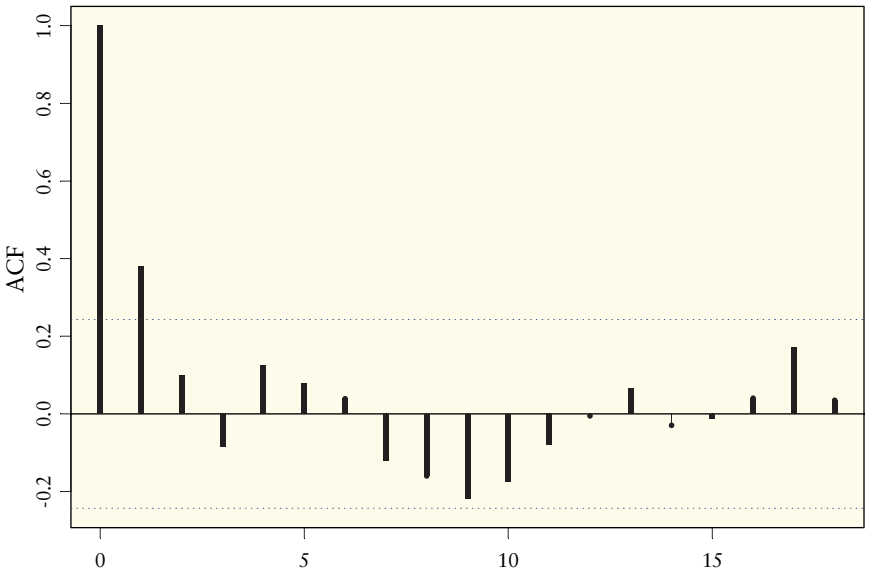
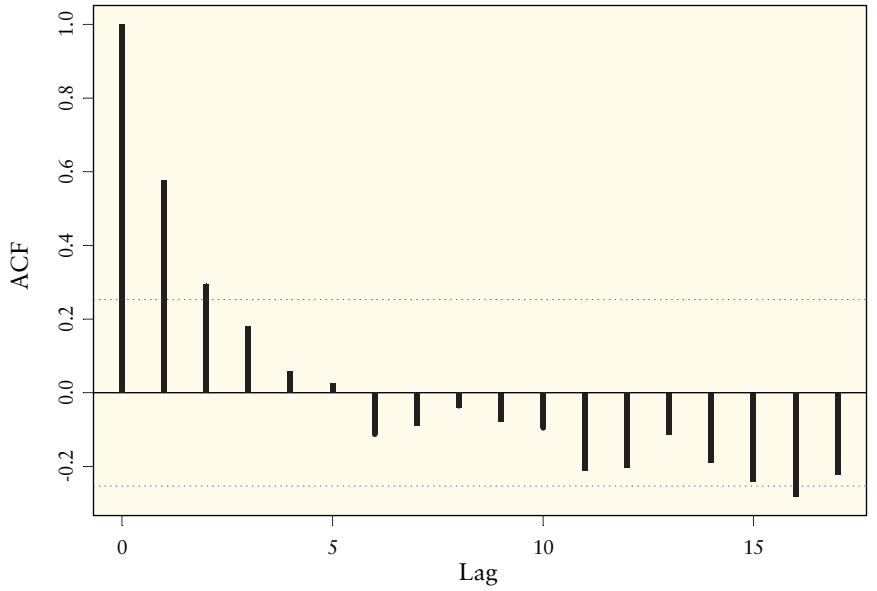


Figure 35: Correlogram for Actual/Trend Time Series on Term Deposits



5.7 ANNUALIZED VOLATILITY

The monthly time series of savings deposits and term accounts from January 2001 to June 2006, the weekly data from June 2004 to May 2006, and the daily time series from June 2005 through May 2006 are used to calculate the annualized volatilities of savings and term deposits (Table 13). The standard deviations are annualized by 12^0.5, 52^0.5, and 250^0.5 for monthly, weekly, and daily observations, respectively.

Table 13: Annualized Deposit Volatilities for BPR Kebomas

ANNUALIZED VOLATILITY	
Ordinary Savings	**Term Deposits**
MONTHLY OBSERVATIONS	
61.24%	46.49%
WEEKLY OBSERVATIONS	
42.45%	30.44%
DAILY OBSERVATIONS	
61.24%	26.96%

Regardless of the observation intervals and time horizon, ordinary savings deposits are more volatile relative to their smaller overall volume

than term deposits. From Figure 30, one would have concluded the opposite, namely that savings deposits are less volatile than term deposits. In large part, this is due to the brief spike in savings deposits in July 2005. But even after suppressing this outlier value, the volatility is still marginally higher for ordinary savings than for term deposits. For example, on the two years of weekly observations, annual volatility is only 32.4 percent after eliminating the July 2005 spike.

Although the observed values seem to indicate that the term deposits are the better, less volatile core deposits, we caution against this general conclusion. In the case of BPR Kebomas, term deposits are very large relative to the overall size of the operation, and they are concentrated in fewer than 100 accounts. If just 10 or 20 depositors decided not to rollover their term deposits over a short period of time, BPR Kebomas could face a significant liquidity challenge. Just because this did not happen during the data period (keeping historical volatility low), one should not conclude that it could not occur. Term deposit withdrawal remains a relevant risk.

5.8 AVERAGE LIFE OF DEPOSIT ACCOUNTS

For completeness, the average life of total ordinary savings and term deposit supply is calculated over a two-year time horizon from June 2004 through May 2006.

Table 14: Days Average Life per Product Group over the June 2004 to May 2006 Observation Period

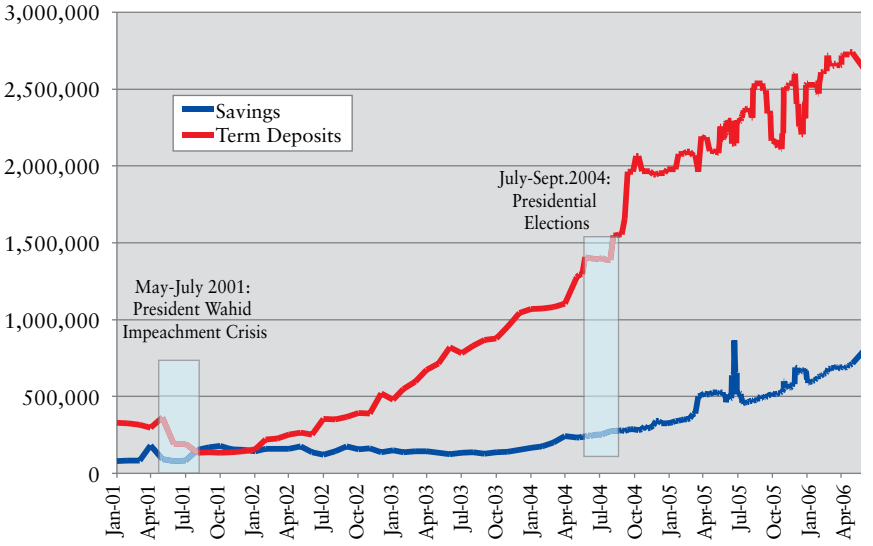
AVERAGE LIFE IN DAYS	
Ordinary Savings	**Term Deposits**
461	568

The result confirms the higher volatility of ordinary savings leading to a shorter average life than term deposits. For each Rupiah in the peak balance, the average time present in the savings accounts was 461 out of a total possible 730 days in the observation period (see Table 14).

5.9 PECULIAR PATTERNS, TREND BREAKS, AND OUTLIER VALUES

Stress events are also reviewed for any potential visible impact on the volume of deposits at BPR Kebomas. Figure 36 depicts another graph of the aggregate deposit time series for ordinary savings accounts and term deposits with two candidate stress events.

Figure 36: Mapping Political Events to Deposit Supply



It appears that the political crisis surrounding the impeachment of President Wahid, the first post-Shuarto president, from May to July 2001 could have contributed to a steep decline in both savings and term deposits. Also, a trend break and modest decline in term deposits accompanies the time around the two rounds of presidential elections from July through September 2004. In contrast, the tsunami disaster around year-end 2004 did not leave a visible mark on deposit balances.

It must be reiterated that sudden drops in deposit supply aligning with known macroevents may be entirely coincidental. One is hesitant to explain changes in the deposit supply at a small rural savings bank with national political circumstances, unless a clear link to the individual lives and economic outlook of the local clients of BPR Kebomas can be made plausible.

Figure 36 again highlights the dramatic spike in ordinary savings volumes in July 2005. However, surges in balances are even harder to explain than sudden drops. While it is plausible that certain macro or institution-specific negative events could lead to a sudden rush to withdraw deposits, confidence-inspiring good news will at best lead to a gradual increase in deposits, not to a sudden spike. So, it is likely that a temporary surge is caused by a single or small number of unusually large transactions of a temporary and exceptional nature. These can be safely discounted when looking at underlying patterns.

6 Equity Bank, Kenya

6.1 BANK PROFILE

Equity Bank started its operations in 1984 as Equity Building Society (EBS). From inception, EBS saw low-income Kenyans who lacked access to financial services as its target market. EBS initially focused on mortgage services, but in the early 1990s it recentered its business model around microfinance. The tremendous growth in the microlending business and customer demands for a broader range of banking services required that EBS convert to the status of a fully chartered commercial bank. Since year-end 2004, it has been registered as Equity Bank Limited.

With the switch to fully computerized banking in 2000, Equity Bank set the stage for rapid expansion in the low-income market. Growth in clients, assets, branch network, and profitability has been phenomenal since then. Equity Bank is now the leader in the microfinance sector in Kenya, with well over 1 million clients[12] and more than a third of all bank accounts in the country. Growth has further accelerated since its successful listing on the Nairobi Stock Exchange in August 2006, which provided access to future fresh capital as well as additional brand recognition.

At year-end 2006, total assets stood at US$294 million (KES 20 billion)[13] with a gross loan portfolio of US$167 million (KES 11.4 billion). Portfolio expansion is driven mainly by lending to small, medium, and micro businesses and the agricultural sector. For 2006, Equity Bank posted US$16 million (KES 1.1 billion) in pretax profits, up from US$7.36 million (KES 501 million) for the previous year.[14]

Equity Bank offers a full range of personal and business current accounts, demand savings accounts, savings plans, term deposits, and foreign currency deposits. Some savings accounts are specifically branded for children, churches, and social institutions; others target special customer groups, such as tobacco farmers contracted to British American Tobacco or members of certain NGOs.

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12 1.438 million as of July 30, 2007.

13 Exchange rate as of July 2007: US$1 = 68 KES (Kenyan Shilling).

14 For additional background on Equity Bank financials, clients and products, see http://www.equitybank.co.ke

All ordinary savings accounts are characterized by no minimum operating balances and very small opening requirements of US$15 (KES 1,000) or less. A basic personal savings account can be opened with as little as US$5.88 (KES 400). Interest is generally paid for balances above US$147 (KES 10,000) at rates of 2–3 percent per annum that have been unchanged since 2001. These rates are in line with average deposit rates in the Kenyan banking industry. Term deposits are accepted for minimum balances of US$147 (KES 10,000) and above at negotiable interest rates, depending on amount and tenor. In total, there were well over 1 million retail deposit accounts by year-end 2006 with balances of US$240 million (KES 16.3 billion) or 82 percent of total assets.

6.2 REGULATORY CONTEXT

Commercial banks in Kenya are supervised and regulated by the Central Bank of Kenya. The prudential regulations applicable to deposit operations and treasury management include the following:

- All Kenyan banks are members of the Deposit Protection Insurance Fund and make regular contributions.
- Banks must observe a cash reserve ratio of 6 percent of customer deposits with the Central Bank of Kenya.
- Banks must maintain a total capital adequacy ratio (Basel I and Market Risk Amendment) of a minimum of 12 percent, of which tier 1 capital must cover at least 8 percent.
- Statutory minimum core capital for banks and mortgage companies has recently been raised to KES 1 billion from the previous (KES 250 million), with a three-year grace period for existing banks to comply.
- Banks must maintain liquid assets of at least 20 percent of all deposits, short-term liabilities, and current maturities of long-term debt.

In 2005, the Central Bank introduced the risk-based supervisory approach, which puts greater emphasis on internal risk management by

banks and less "intrusive" examinations by the Central Bank of Kenya. Equity Bank established an asset and liability management committee and implemented internal risk management policies and procedures covering all major risks: liquidity, capital adequacy, interest rate risk, foreign exchange risk, credit, market, and operational risk. It has independent risk management, compliance, and internal audit departments that report directly to the Board and ensure adherence to the operational procedures, risk management policies, and accounting guidelines.

6.3 INCOME CONTEXT

Kenya has a GNI per capita of US$530 (Atlas) or US$1,170 (PPP). At these levels, Kenya ranks number 171 and 187, respectively, in the world. The most recent available data from 1997 show that 52 percent of Kenyans live below the national poverty line; 22.8 percent live on less than US$1 per day, and 58.3 percent live on less than US$2 per day.

Equity Bank's deposit operations, particularly in the most important ordinary savings accounts, are well representative of the low-income, SBDs required for this study.

6.4 BANK ELIGIBILITY

For the purposes of analysis, various products and associated balances are grouped into three broad categories: (*i*) ordinary demand savings accounts, (*ii*) retail term deposits, and (*iii*) current accounts used for checking and transaction purposes (Table 15).

Table15: Structure of Deposits at Equity Bank

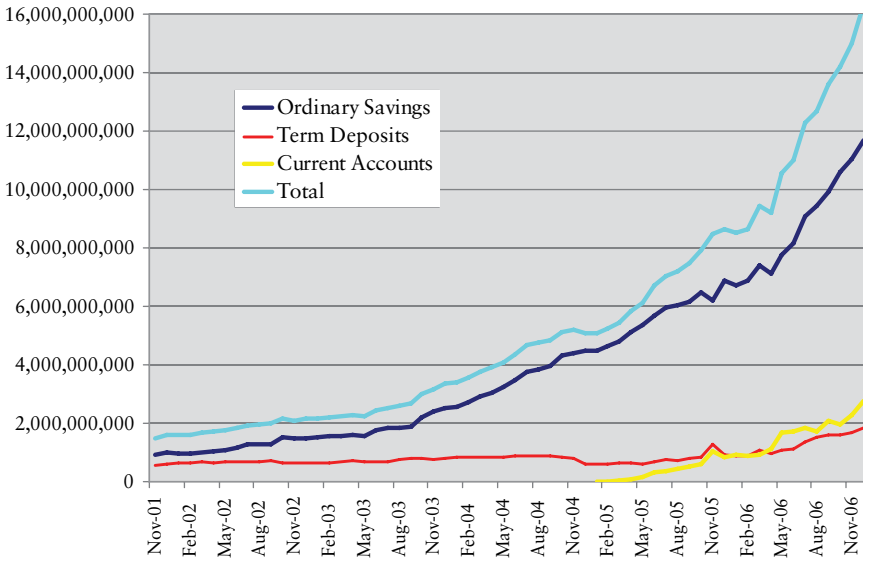
Date	Ordinary Savings			Retail Term Deposits			Current Accounts			Total		
	KES Amount	Accounts	Average Balance	KES Amount	Accounts	Average Balance	KES Amount	Accounts	Average Balance	KES Amount	Accounts	Average Balance
31-Dec-05	6,890,239,529	595,762	$170	911,250,828	5,395	$2,484	839,401,295	5,563	$2,219	8,640,891,652	606,720	$209
31-Jan-06	6,707,024,286	616,921	$160	872,065,905	5,811	$2,207	929,415,059	6,327	$2,160	8,508,505,250	629,059	$199
28-Feb-06	6,872,415,821	638,327	$158	874,939,147	6,136	$2,097	885,852,727	6,987	$1,864	8,633,207,695	651,450	$195
31-Mar-06	7,415,317,370	662,138	$165	1,098,416,528	6,553	$2,465	938,206,760	7,867	$1,754	9,451,940,658	676,558	$205
30-Apr-06	7,102,382,325	682,398	$153	952,694,334	6,914	$2,026	1,139,602,942	8,607	$1,947	9,194,679,602	697,919	$194
31-May-06	7,770,349,061	710,634	$161	1,092,376,404	7,381	$2,176	1,693,355,767	9,627	$2,587	10,556,081,231	727,642	$213
30-Jun-06	8,175,451,653	740,740	$162	1,122,697,573	7,843	$2,105	1,710,969,931	10,709	$2,350	11,009,119,156	759,292	$213
31-Jul-06	9,085,614,248	773,734	$173	1,352,320,303	8,479	$2,345	1,842,929,003	11,980	$2,262	12,280,863,554	794,193	$227
31-Aug-06	9,441,172,382	813,653	$171	1,505,993,274	9,108	$2,432	1,739,232,692	13,272	$1,927	12,686,398,348	836,033	$223
30-Sep-06	9,920,475,468	863,897	$169	1,593,791,025	9,699	$2,417	2,072,783,902	14,568	$2,092	13,587,050,395	888,164	$225
31-Oct-06	10,619,855,564	906,227	$172	1,619,313,688	6,137	$3,880	1,955,757,104	15,734	$1,828	14,194,926,356	928,098	$225
30-Nov-06	11,052,188,003	949,382	$171	1,662,523,409	7,888	$3,100	2,294,145,470	16,813	$2,007	15,008,856,882	974,083	$227
31-Dec-06	11,676,237,565	988,474	$174	1,853,578,037	8,323	$3,275	2,772,447,844	17,677	$2,306	16,302,263,446	1,014,474	$236

As can be expected, retail term deposits have substantially higher average amounts per account than ordinary savings. But the overwhelming bulk of the deposits mobilized by Equity Bank is contained in almost 1 million ordinary demand accounts with low individual balances of only US$174 equivalent on average.

6.5 LONG-TERM TRENDS AND SEASONAL PATTERNS

A visual inspection of the long-term deposit trends from November 2001 through December 2006 (Figure 37) clearly shows that most of the exponential growth in total deposits is driven by the large number of ordinary savings accounts. Current accounts were introduced only in March 2005, but they are also displaying significant growth. Larger term deposits are also growing, but at a lower rate. Despite the strong growth of the cheaper ordinary demand deposits, Equity Bank made a strategic decision to develop its business banking franchise in parallel and also attract higher yielding term deposits from small business, corporations, and even government-operated businesses.

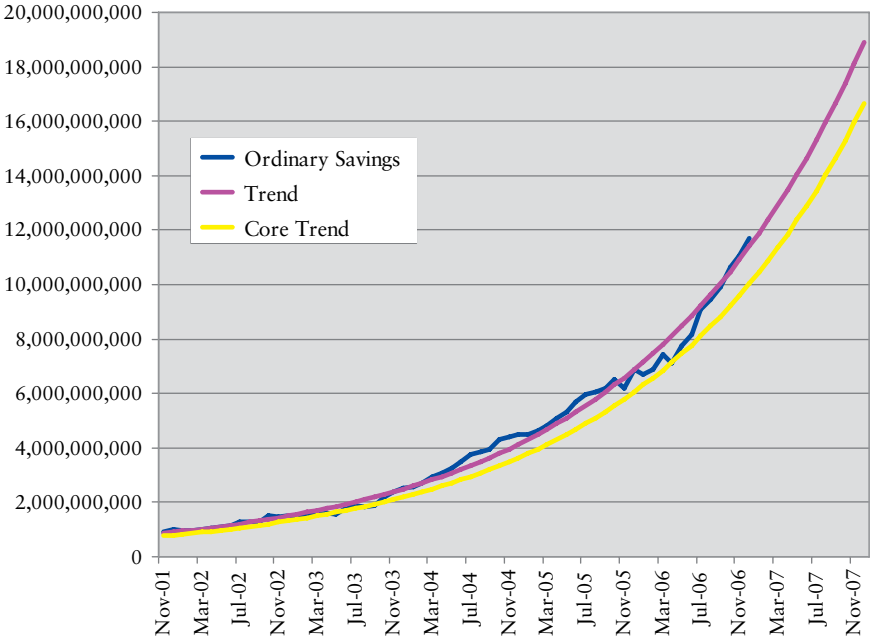
Figure 37: Long-Term Development of Deposit Supply, by Product Category



Looking more closely at ordinary savings deposits, one notices that the deposit aggregates conform surprisingly closely to a steep exponential growth trend (Figure 38). The core deposit support line based on local minima therefore is almost identical to the normal regression line using all observations.

In fact, only 7 out of 62 monthly observations display lower balances than the previous month; otherwise, the curve rises monotonously.

Figure 38: Actual Ordinary Savings Balances, Long-Term Trend, and Core Deposit Support Line



As the small deviations of the actual ordinary savings balances from their trend line in Figure 38 suggest, there is no clear seasonal pattern discernable in the overall supply. Monthly Actual/Trend relative deviations for the five years from 2002 through 2006 were calculated, and their averages were taken to detect a potential annual seasonal cycle (Figure 39). Other than a weak tendency to peak in July and October, the graph of the seasonal indexes is inconclusive. This impression of negligible seasonality is confirmed by the autocorrelation analysis, which yields nonsignificant determination levels for the relevant lags between 6 and 12 months (Figure 40).

Figure 39: Seasonal Index Values Actual/Trend for 2002 to 2006 and Average Index

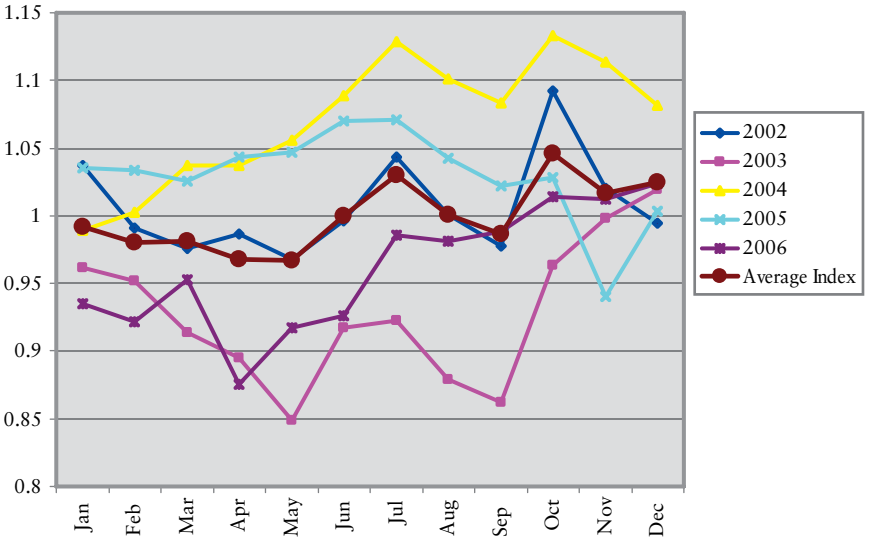
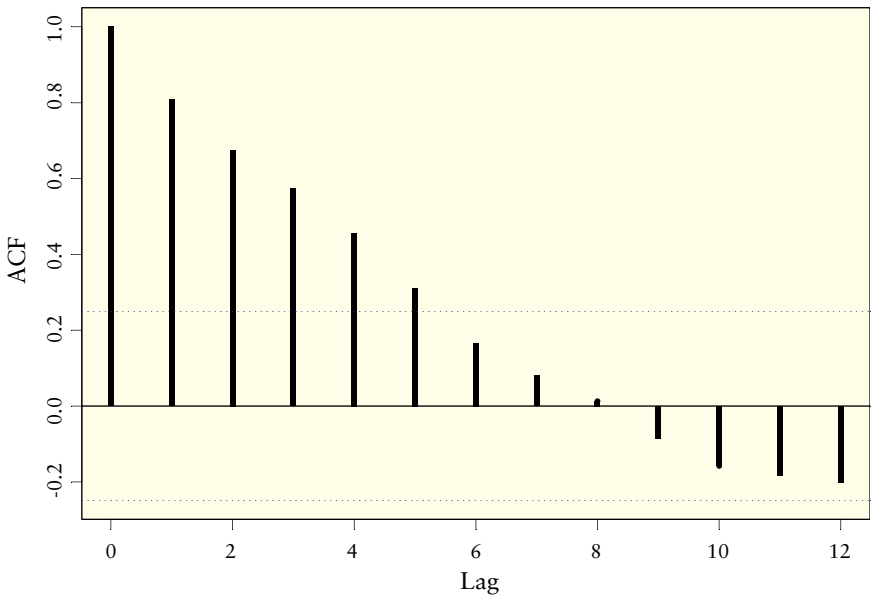


Figure 40: Correlogram for Actual/Trend Time Series on Ordinary Savings Balances



6.6 ANNUALIZED VOLATILITY

Unfortunately, Equity Bank was not able to reconstruct deposit balances at daily or weekly intervals beyond the recent history that is held online in its system.[15] As a result, deposit volatility is estimated using the 62 month-end balances from November 2001 through December 2006. Assuming that the underlying stochastic behavior of aggregate deposit supply remained stable over the observation period and that the relative deviations from the trend are normally distributed, this calculation gives comparable results to the volatility measures calculated on daily intervals. Ultimately, monthly observations are also daily snapshot values; they are just more widely spaced, and the wider interval between the observations is accounted for by scaling the standard deviation accordingly. The volatilities (Table 16) therefore are calculated as the standard deviation of the logarithmic relative month-on-month change, annualized with a scaling factor of 12^0.5. For current accounts, the volatility is based on just the 22 observations since introduction in March 2005. They are thus significantly less predictive than the other volatilities.

Table 16: Annualized Volatility by Deposit Category

ANNUALIZED VOLATILITY		
Ordinary Savings	**Retail Term Deposits**	**Current Accounts**
14.43%	34.50%	120.12%

The relative dimensions of volatility (Table 16) align well with the intuitive expectation that large aggregates of many small demand savings accounts should have a low volatility, while total term deposit balances (due to their "lumpiness" and higher competitive sensitivity) should be more volatile. Current accounts should typically display the highest volatility (as is the case here), because they are subject to frequent transactions, and their purpose is not the accumulation of funds but the facilitation of ongoing receipts and payment requirements.

A forward confidence interval is established using the volatility together with the assumption about normally distributed deviations from the growth trend. This interval drapes around the trend line prediction as the mean and delimits the area in which we expect future ordinary savings supply to fall with a probability of +/- 2 standard deviations (σ) or 95.4 percent (Figure 41).

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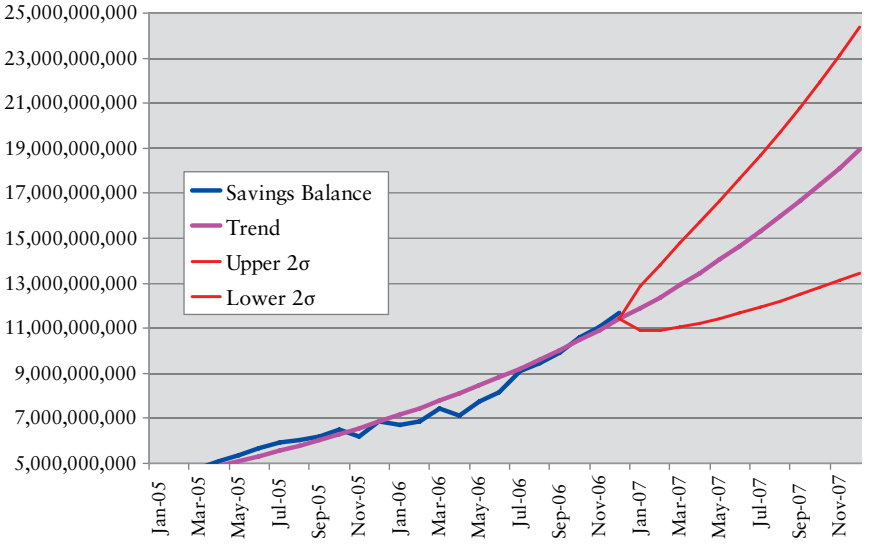
15 In its legacy IT system, Equity Bank maintained distributed databases at each branch that were co - solidated via data tapes only once a month. Its new core banking solution implemented in November/ December 2005 should be able to reproduce such daily closing balances going forward.

Figure 41: Ordinary Savings Deposits, Actuals, Trend, and 95.4% Forward Confidence Interval



6.7 AVERAGE LIFE OF DEPOSIT ACCOUNTS

The calculation of average deposit life over the two-year observation period from January 2005 through December 2006 produces some surprisingly short average life spans: between 9 and 15 days out of 730 (Table 17).

Table 17: Average Life of Deposits by Product Category

DAYS AVERAGE LIFE		
Ordinary Savings	**Retail Term Deposits**	**Current Accounts**
15	13	9

ALTERNATIVE CALCULATION BASED ON STARTING BALANCE		
Ordinary Savings	**Retail Term Deposits**	**Current Accounts**
730 out of 730	729.7 out of 730	363.7 out of 365

The case of Equity Bank represents a drastic example of the effect seen in the average deposit lives at Allied Bank: in rapidly growing balances, the average life becomes very short, because the high balances are all concentrated toward the end of the observation period. This effect increases the divisor in the calculation, while at the same time the newer higher balances have not "had a chance to be present" in the values observed earlier. For this reason, an alternative calculation is applied that tracks only the balance

on the first day in the observation period and calculates for how many days on average each shilling in the initial balance was present in the accounts over the course of the period. If balances are monotonously rising, the result is obviously 365 days over a one-year period or 730 days over a two-year period (see the alternative calculation in Table 17). Since current accounts were introduced only in the course of 2005, January 2006 is used as the starting balance for a one-year observation period. The interpretation of this alternative calculation is simply that if the 11 billionth shilling were present in the ordinary savings balances on December 31, 2006, it is almost certain that there will be at least 11 billion shilling in ordinary savings at any point in time during the next two years, because the deposit supply keeps steadily trending upward.

6.8 PECULIAR PATTERNS, TREND BREAKS, AND OUTLIER VALUES

Stress events did not appear in the data. In net result, it is difficult to identify any distinct events that could be mapped to depositor behavior at Equity Bank, or in the Kenyan banking system in general. The deposit balance curves at Equity Bank are remarkably free of any conspicuous sudden drops or spikes that beckon for an external explication. Thus it would be entirely arbitrary to force any relationship between national events and the deposit supply at the bank.

Over the last 10 years, Kenya has not experienced a systemic confidence or liquidity crisis in the banking sector. There have also been no recent bank-specific crises or bank failures that could have had a contagion effect on Equity Bank. Kenya also has not suffered any major macroeconomic disruptions in the new century. In fact the economy has seen positive growth throughout the last 10 years, with an impressive acceleration to 5–6 percent per annum recently.

On the political front, the December 2002 general elections were peaceful and did not have any negative effects on the financial sector. The national referendum on a new constitution for Kenya in November 2005 did not affect the operations and stability of the banking sector, despite the government losing the vote on the proposed constitution draft. Overall, the impression is that economic confidence and trust in the banking system has reached a level where political turbulence does not easily translate into panicked reactions by depositors.[16]

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16 As of this writing, it appears that deposit supply also remained largely unaffected by the period of violence and political instability following the disputed December 27, 2007, general election in Kenya.

In terms of natural disasters, there was a major drought and the threat of famine in 2005, but negative impacts on the economy overall were avoided because of a concerted effort by government and international relief agencies. Cattle ranching would have been the most affected economic activity, because many animals were lost due to lack of grazing. By 2005, Equity Bank had not yet established a significant presence in the agricultural lending business, and thus it did not experience credit losses in this area that could potentially have dented depositor confidence in the bank.[17]

Finally, with the high returns on the Nairobi Stock Exchange in recent years, one could speculate about a shift of funds away from low-yielding deposits into the stock market, putting pressure on the core deposit supply at Equity Bank. However, the growing deposit volumes realized do not provide any evidence to support this assumption. With its focus on small deposits from low-income households, it seems Equity Bank is not vulnerable to such a shift to alternative investments.

17 By December 2005, Equity Bank had lent only 4 percent of its KES 5.7 billon gross portfolio to the sector through farm input loans and agricultural commercial loans. The largest proportion of customers in rural areas is farmers of coffee, tea, dairy, maize, pyrethrum, horticulture, and wheat (Rift Valley province).

7 BancoSol, Bolivia

7.1 BANK PROFILE

BancoSol generally needs no introduction. The bank is the leader in microfinance services in the Bolivian market, and it is a widely recognized example of global best practices in banking with the economically active poor.

BancoSol traces its roots to a 1984 initiative by Bolivian microentrepreneurs that led to the creation of Fundación para Promoción y el Desarrollo de la Microempresa (PRODEM) in 1986 with the help of ACCION. PRODEM pioneered the concept of microcredit in Bolivia. In 1992, the growing microcredit business was incorporated into a licensed commercial bank under the name Banco Solidario S.A., or BancoSol, with a clientele of 22,000 borrowers and a portfolio of US$4.71 million (36 million Bolivianos).[18] As of year-end 2006, BancoSol had more than 100,000 borrowers representing a total loan portfolio of US$170 million. The bank operates in seven cities (La Paz, Cochabamba, Santa Cruz, Oruro, Tarija, Potosí, and Sucre) through a network of 48 branches. Women account for 63 percent of BancoSol's clients and represent 53 percent of the loan portfolio. Most of the clients are young, with the largest group of clients in the 35 to 40 year age bracket, and they have relatively low levels of education. A majority of clients continue to operate in the informal economy, which makes up more than 20 percent of Bolivian GDP and generates employment for over 65 percent of the population.

As of December 2006, total assets at BancoSol stood at US$231 million, which earned a 2006 profit of US$4.7 million (i.e., a return on assets of 2.3 percent and a yield on equity of 22.9 percent). Customer deposits fund 66.4 percent of total assets (or 95.3 percent of the total loan portfolio); these funds are denominated in both U.S. dollars and Bolivianos. Total deposits in December 2006 came to US$153 million in more than 100,000 accounts. Among the 13 commercial banks operating in Bolivia in 2006, BancaSol's market share in total customer deposits was 4.03 percent.

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18 January 2008 exchange rate: US$1 = 7.64 Boliviano.

7.2 REGULATORY CONTEXT

There are three types of financial institutions active in the microcredit sector in Bolivia: commercial banks, member-driven organizations like credit unions and cooperatives, and private financial funds, which are recognized as a form of regulated nonbank financial institution. All financial institutions are supervised by Bolivia's Superintendent of Banks and Financial Entities (SBEF) in collaboration with the Central Bank of Bolivia. The financial institution category of private financial funds (PFF) was specifically created by SBEF to serve the microcredit sector. At present, this is the most common form of MFI in Bolivia.

However, only fully chartered commercial banks, including BancoSol, may accept savings and current accounts from the general public.

The Bolivian banking system has experienced frequent liquidity pressures, and bank liability supply is generally vulnerable to political turbulence and macroeconomic disruptions. SBEF and the Central Bank of Bolivia have intensified their efforts at monitoring banks' capitalization and liquidity position. The prudential regulations governing statutory liquidity reserves, maturity structure of liabilities, and minimum reserve requirements have been progressively tightened since the early 2000s.

7.3 INCOME CONTEXT

Bolivia is still among the poorest countries of Latin America. For 2005, GNI per capita in Bolivia amounted to US$1,100 (Atlas) and US$2,740 (PPP). These figures rank Bolivia as number 147 and 151, respectively, in the global GNI per capita league tables.[19] The last available data from a 1999 survey put 62.7 percent of the population below the national poverty line. In 2002, 23.2 percent of Bolivians lived on less than US$1 per day; 42.2 percent lived on less than US$2 per day.

7.4 COUNTRY BACKGROUND AND STRESS EVENTS

Major recent sociopolitical events that may have affected bank depositor behavior and may also have had an impact on low-income savers at BancoSol include the following:[20]

- **Systemic liquidity crisis in July 2002:** The Bolivian banking system lost 21 percent of total customer deposits.
- **February and October 2003:** Periods of social unrest led to the resignation of President Sanchez de Lozada.

19 World Development Indicators database, World Bank, www.worldbank.org.
20 Compare Gómez and González-Vega (2006).

- **April–July 2004:** A systemwide deposit loss of roughly 8 percent occurred, following the announcement of a tax on financial transactions and compounded by the political uncertainty ahead of the referendum on the natural gas resources.
- **October–December 2005:** Turbulent political developments lead up to the election of Movement Toward Socialism leader Evo Morales as president.

7.5 BANK ELIGIBILITY

Customer deposits at BancoSol are raised in two straightforward product types: savings accounts and term deposits. Savings accounts are available in Bolivianos or U.S. dollars, and they require a minimum balance of US$20. Interest is paid monthly on the average balance at an annual rate of 1 percent on dollar accounts and 4.5 percent on Bolivianos. Withdrawals and deposits can be made at any BancoSol branch without any restrictions. Term deposits are offered in Bolivianos as well as in U.S. dollars, with maturities starting at 30 days. The minimum amount required to open a term deposit is US$200. Rates paid on term deposits are stratified by size and tenor and range from 4.5 percent to 7 percent in Bolivianos and 1–5.5 percent in U.S. dollars.

The composition of deposit balances (Table 18) clearly qualifies BancoSol as a candidate for this study: 85.7 percent of all deposit accounts hold balances of US$500 (equivalent) or less, and the average account size is only US$48. Of a total of 102,391 accounts, only 137 had balances above US$100,000. The smallest accounts with balances less than US$1,000 still contributed 6.9 percent toward the total customer deposit supply at BancoSol. Naturally, a relatively small number of large accounts does dominate the picture in terms of total balance supplied. This raises the concern that if fluctuations of deposit volumes are observed in total or by product, one may end up measuring the behavior of a few large accounts, while the many small accounts and their stability (or volatility) becomes just a rounding error. Fortunately, BancoSol was able to provide stratification data similar to the June 2006 snapshot (Table 18) for monthly increments from January 2002 onward. These data make it possible to calculate separate component volatilities and trends for just the small accounts below $1,000, for example.

Table 18: Stratification of Total Customer Deposits (June 2006)

	Balance USD	% of Total Balance	% of Balance Cum.	No. of Accounts	% of Accounts	% of Accounts Cum.	Average Balance USD
USD 0 - 500	4,206,130	3.5%	3.5%	87,766	85.7%	85.7%	48
USD 501 – 1,000	4,131,801	3.4%	6.9%	5,560	5.4%	91.1%	743
USD 1,001 – 5,000	15,148,659	12.6%	19.5%	6,584	6.4%	97.6%	2,301
USD 5,001 – 10,000	9,476,117	7.9%	27.4%	1,313	1.3%	98.9%	7,217
USD 10,001 – 15,000	4,321,456	3.6%	30.9%	350	0.3%	99.2%	12,347
USD 15,001 – 20,000	2,878,927	2.4%	33.3%	159	0.2%	99.4%	18,106
USD 20,001 – 50,000	10,086,207	8.4%	41.7%	287	0.3%	99.6%	35,144
USD 50,000 – 100,001	21,424,904	17.8%	59.5%	235	0.2%	99.9%	91,170
USD 100,001 – 1 mil	43,672,797	36.2%	95.7%	134	0.1%	100.0%	325,916
USD 1 mil and above	5,156,194	4.3%	100.0%	3	0.003%	100.0%	1,718,731
Total	**120,503,193**	**100.0%**		**102,391**	**100.0%**		

7.6 LONG-TERM TRENDS AND SEASONAL PATTERNS

The balances for the long-run time series of deposit balances by product for December 1998 through December 2005 have been consolidated into U.S. dollar-equivalent totals for the two product groups, ordinary savings account and term deposits (Figure 42).

Figure 42: Long-Term Deposit Supply Trend, by Product Category (US$)

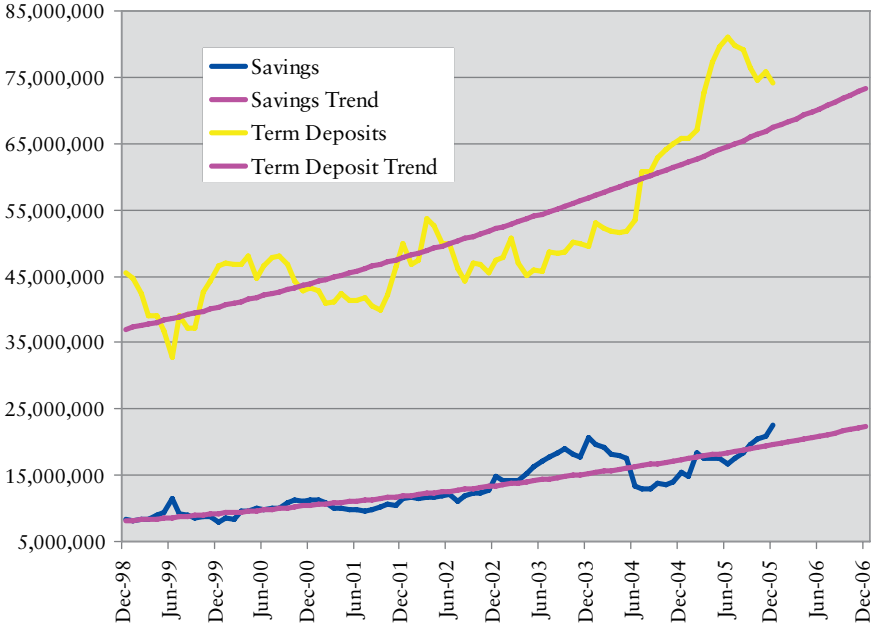
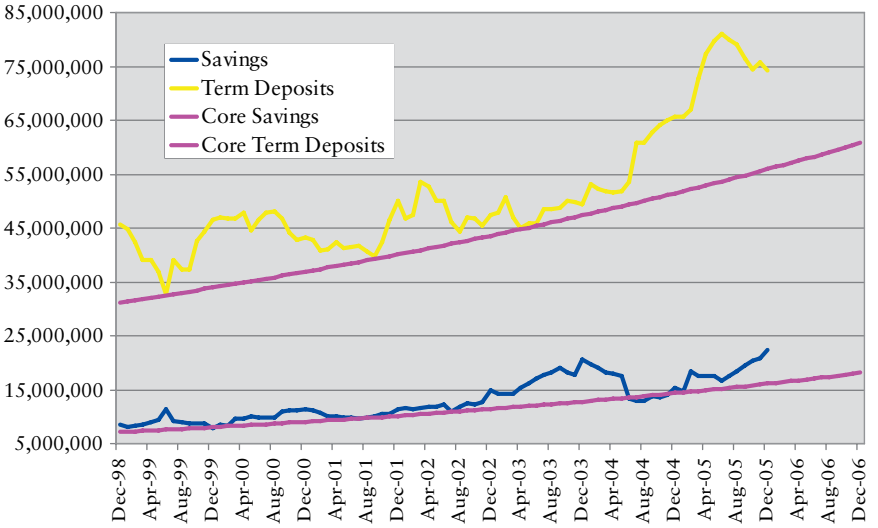


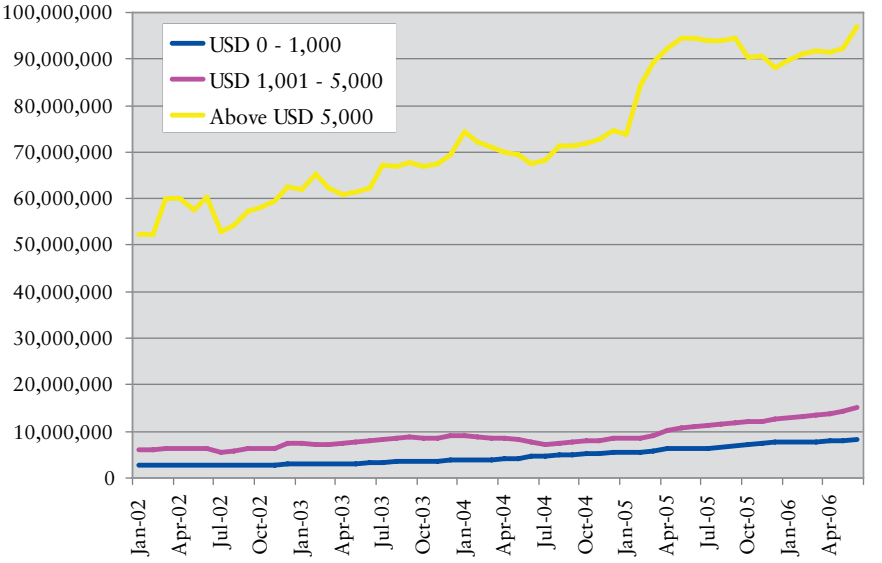
Figure 42 highlights the dominance of larger term deposits in regard to total balance supply at BancoSol. December 2005 term deposits stood at US$74.2 million while ordinary savings accounts amounted to US$22.5 million. Term deposits also display a steeper growth trend than savings accounts, and their volatility appears (in terms of absolute balance fluctuations, at least) significantly higher than for ordinary savings. Hence, the core deposit support trend using local minima discounts term deposits substantially more than savings balances (compare to Figure 43).

Figure 43: Long-Term Deposit Supply Actuals and Core Balance Trend, by Product (US$)



We return to the question of which strata of accounts drive the behavior of aggregate deposit balances at BancoSol: the many small accounts or the few large ones? The month-by-month balance stratification from January 2002 to June 2006 is used to create the deposit supply graph by size range (Figure 43). Note that the stratification of deposits does not distinguish by product, but it is believed that the lowest cluster of accounts up to US$1,000 will be dominated in number and volume by the ordinary savings accounts. For accounts with amounts above US$5,000, it can be safely assumed that the vast majority of these accounts are committed to fixed terms at higher interest yields. Also, Figure 44 makes no attempt to compensate for a potential size migration issue as mentioned in the discussion of the general definition of SBDs. At each monthly data point, the balance for the account size range includes all the accounts that had balances in that range on that day. How specific accounts (that were in the range at a particular starting point) behave over time and migrate through the size bands is not tracked.

Figure 44: Long-Term Deposit Actuals Stratified by Account Size (in US$ at fixed conversion rate of US$/BOB 7.83)

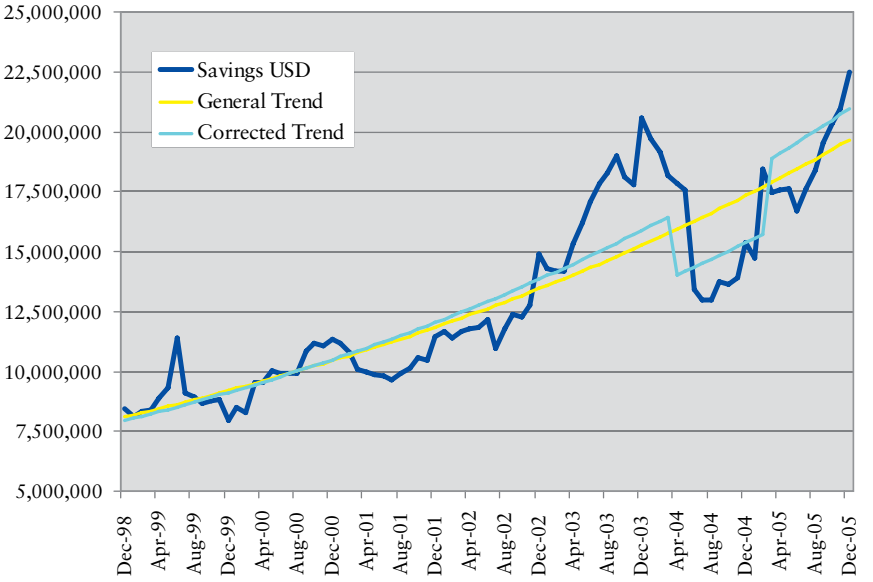


Nonetheless, Figure 44 illustrates clearly how the small accounts appear to contribute small but steady core balances, while the massive swings in total balances are mainly driven by the few accounts in the large balance range. This argument continues to hold true when adjusting the graph for the smaller absolute scale of the small deposit ranges.

Of course, visual inspection of a graph can provide only a first impression of the relative volatility of deposit size ranges and products. A more reliable measure of relative volatility is calculated in Section 7.7.

Turning first to potential seasonality in the supply of ordinary savings, an adjustment to the underlying trend curve provides a better fit against which to benchmark the actual monthly observations. The systemwide deposit loss during the economic and political crisis around the national gas referendum in 2004–2005 calls for a trend correction for the period from April 2004 to February 2005 using a dummy variable (gas referendum crisis yes = 1, gas referendum crisis no = 0). The actual monthly observations, together with the general trend regressed to time and the adjusted trend line that incorporates the dummy variable, are shown in Figure 45.

Figure 45: Total Ordinary Savings in U.S. Dollars, General Trend and Adjusted Trend Line



Using the adjusted trend (Figure 45), the annual seasonal index values are charted for the total ordinary savings volumes for each of the years 1999 through 2005 (Figure 46).

Figure 46: Seasonal Index Actual/Trend for Ordinary Savings Balances (1999–2005)

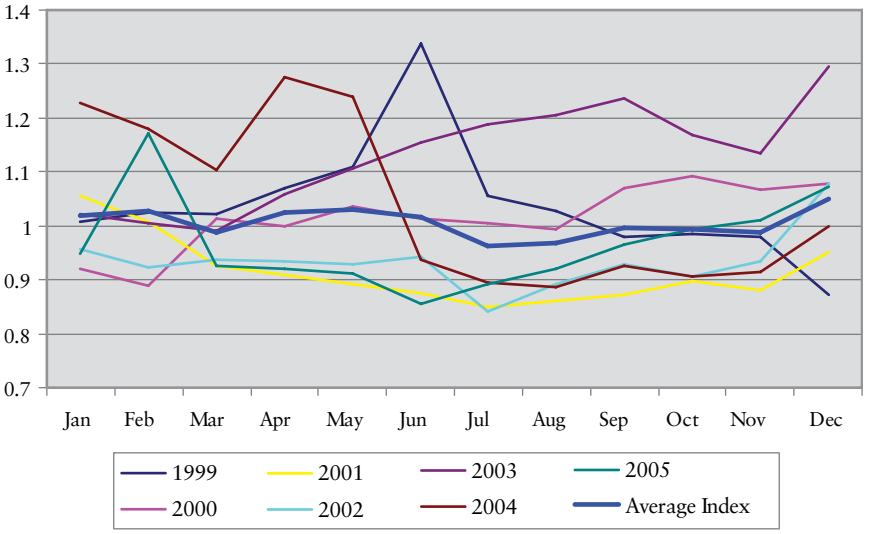
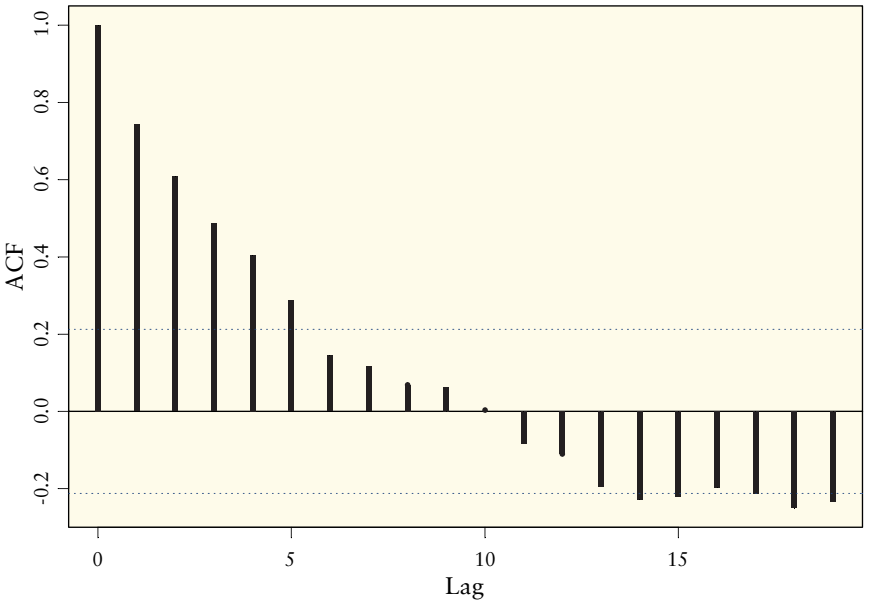


Figure 46 illustrates that there is no immediately apparent strong annual seasonal pattern. The average index shows a dip in deposits in July (96.1 percent of trend) and an average peak in December (104.9 percent of trend). The significance of this averaged pattern seems limited, however, because it is derived from a wide distribution of actual observations for each calendar month, with values well above and below the underlying trend in each case. Even weighing the average index values more toward recent observations does not produce a much clearer pattern.

The autocorrelation test confirms this inconclusive result. There is strong short-lag serial dependency again indicating a tendency to have clustered high and low values relative to trend, but the significance of annual cycle seasonality is negligible (Figure 47).

Figure 47: Correlogram for Actual/ Adjusted Trend Time Series on Ordinary Savings Balances



7.7 ANNUALIZED VOLATILITY

Standard relative logarithmic volatility measures are applied to both the long-run monthly time series by product type (January 1998 to December 2005) and the shorter stratification time series (January 2002 to Jun 2006) (Table 19).

Table 19: Annualized Volatilities by Product and by Balance Range

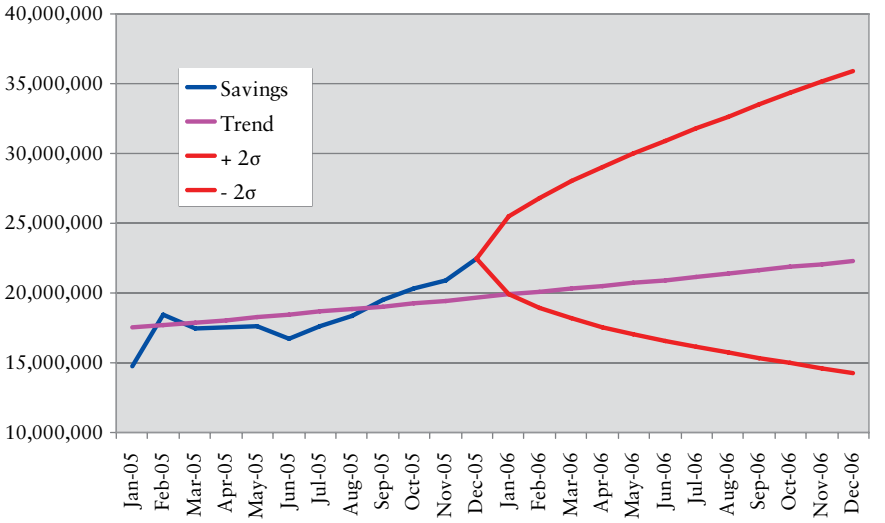
ANNUALIZED VOLATILITY BY PRODUCT		
Savings	**Term Deposits**	**Total Deposits**
24.24%	13	13.38%
ANNUALIZED VOLATILITY BY BALANCE		
USD 0 - 1,000	**USD 1,001 - 5,000**	**Over USD 5,000**
8.13%	14.06%	14.36%

The result for the classification by product is somewhat surprising in that the savings balances display a substantially higher annualized volatility than the larger term deposits. The impression from the charts and conventional expectations would have it the other way around. The calculation is correct nonetheless: relative to the absolute size of the product balances and net of the underlying exponential trend, savings balances at BancoSol have fluctuated more on average than term deposits from 1998 to 2005. The average life calculation in section 7.8 also supports this result. Some compensation effect between savings and term deposits must also regularly occur at BancoSol, because the volatility of the term deposits and ordinary savings combined is smaller than either of the component volatilities.

Curiously then, when looking at volatility across products by account size range (Table 19), the result is inverted again, with the smaller accounts looking least volatile and the larger accounts fluctuating more. This effect could well be caused by the size migration issue in the data: the $0–$1,000 range includes only the accounts that had balances in that bracket on the respective month-end date—precisely the large movements within accounts that would make the balance volatile have the least effect on the narrow lowest account size range. That is, if an account grows rapidly and breaches the $1,000 cut-off, that entire balance is shown in the higher bracket. If a larger account is drawn down, the full account is lost in the upper bracket balance and shows up in the lower bracket only with the small residual value. Hence, there is a logical tendency to have lower volatility in the narrower and lower size ranges than in the wider upper ranges.

Finally, the volatility result is used for the savings product together with the usual assumption about normally distributed relative logarithmic deviations from the trend line to derive a forward confidence interval of aggregate savings supply. With 95.4 percent probability, total ordinary savings accounts will not drop below US$14.3 million over a period of 12 months forward from December 2005 (Figure 48).

Figure 48: Ordinary Savings Deposits, Actuals, Trend, and 95.4% Forward Confidence Interval



7.8 AVERAGE LIFE OF DEPOSIT ACCOUNTS

Table 20 shows the result of the standard average life calculation over the two-year reference period from December 2003 to December 2005. The results show shorter average lives for savings deposits compared to term accounts, as well as shorter average lives for the smaller balance ranges compared to larger accounts across both products. Shorter lives are compatible with higher volatility, because for each currency unit in the peak balance per account range or product, the average life indicates how many days out of the 730 maximum that unit was present in the total balance.

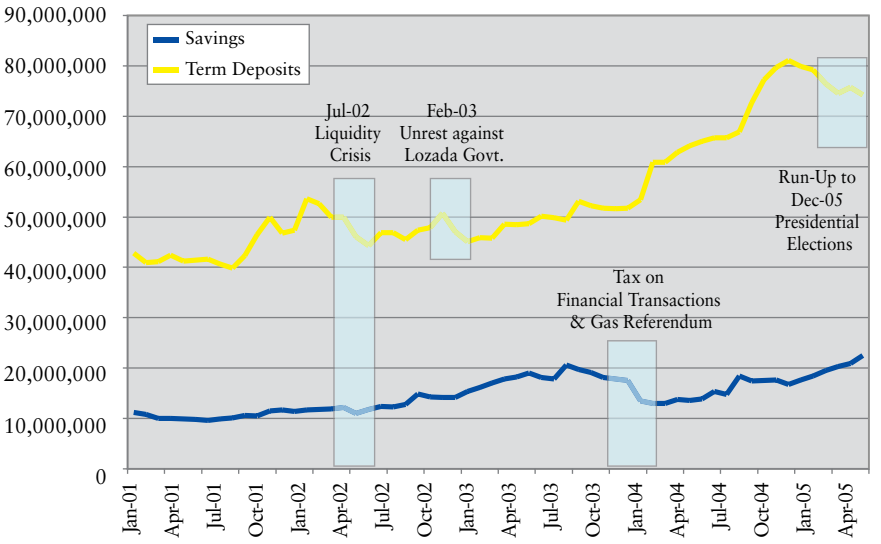
Table 20: Days Average Life by Product and by Balance Range (December 2003 to December 2005)

DAYS AVERAGE LIFE				
By Product		By Balance Range		
Savings	Term Deposits	USD 0 – 1,000	USD 1,001 – 5,000	Above USD 5,000
556	600	532	544	623

7.9 PECULIAR PATTERNS, TREND BREAKS, AND OUTLIER VALUES

With the usual cautions about coincidence rather than causality, one can find some co-movement between most of the stress events identified in Section 7.4 and the term deposit supply and/or the ordinary savings at BancoSol (Figure 49). However, no match was found for the October 2003 unrest around the resignation of President Lozada.

Figure 49: Mapping Macro Events to Deposit Supply Disruptions at BancoSol



Overall, it appears that BancoSol was less affected by the deposit losses during the stress events than the Bolivian commercial banking sector on average. The July liquidity crisis brought a drop in total deposits of only 9.2 percent between May 2002 and the low point in August 2002 compared to 21 percent systemwide. The combination of the tax on financial transactions and the uncertainty ahead of the referendum on the natural gas resources appears to have a significant impact on savings deposits at BancoSol, which dropped by 27.3 percent between April and July 2004. However, the total deposit volume, including term balances, remained unaffected and even grew by 6.3 percent over the same period.

This echoes the results found by Gómez and González-Vega (2006) in their study of the liquidity of the Bolivian financial system during repeated systemic shocks since 2000. According to their findings, financial institutions in Bolivia were rather unevenly impacted by the deposit losses during

the socioeconomic and political crises. It appeared that microfinance operators, including BancoSol, as well as credit unions and financial cooperatives (who may accept savings deposits from members), were generally less affected than more up-market commercial banks. Gómez and González-Vega explain this effect with the higher degree of diversification of deposits in the sense of a large proportion of small individual accounts. MFIs also appear to manage the volatility of the larger term deposits well by discouraging early withdrawals with fees and interest penalties. Although these would generally not prevent an institution-specific run on deposits, these measures might discourage nervous impulse withdrawals by depositors who worry about political unrest and inconvenience due to curfews and temporary branch closures.

8 Summary and Conclusions

Table 21 provides a cross-institutional summary of the principal observations from this study. As a reference, the table also includes some key deposit statistics from a large German universal bank (in a high-income country with fully developed financial markets). These data have been obtained by Frankfurt School in the context of an unrelated confidential research project in 2003. They are used here on the condition that the origin of the data is not disclosed.

This study makes no claim that the findings from the five institutions have any generalized significance in a statistical sense. They are merely pegs in the ground in a vast and diverse field of financial markets, types of institutions, and operating environments. Nonetheless, together with some measure of general experience in developing financial markets, some interesting observations and lessons-learned emerge that remain to be validated by further, much broader cross-sectional studies.

Customer deposits are the fundamental funding source

With limited access to capital market instruments (bonds, commercial paper, repossessions, interbank borrowing, securitizations, etc.), mobilizing customer deposits is fundamental to balance sheet growth and to maintaining a stable, low-cost liability base. All five institutions have very high proportions of customer deposits to total assets. In essence, the funding side of their balance sheets consists only of customer deposits, equity, some long-term borrowing (often concessionary), and possibly a bit of short-term interbank liabilities.

Banks underemphasize deposit supply analysis

Despite the preeminence of customer deposits in emerging and developing markets, local banks often do not dedicate enough effort in analyzing their deposit supply. This applies to the five cases in this report, but obviously even more so to the several other banks and deposit-taking MFIs that were initially approached about participating in this study but declined. Despite the common emphasis on "knowing your customer" and the data retention requirements under anti-money laundering rules, we were surprised at how

little systematic data are available on depositor demographics (occupational and income profiles, etc.).

For such information to be useful and accessible for analysis, it must be captured and maintained in a structured database that can be mapped to transaction data. Old-style transaction processing systems do not meet these requirements, because their data volumes become so large that banks can hold only a few months of history online, before archiving it to backup tapes or microfiche. What is needed is a combination of a data warehouse that holds elementary account transactions and balances as well as a well-maintained static descriptor database containing addresses, gender, date of birth, profession, education level, income, and so on. Allied Bank, for example, has just begun to install such a new generation core banking system, and it is very interested in leveraging this investment into a much deeper understanding of its customer base and its behavioral patterns.

Seasonality is weak

In Allied Bank's case, there are some plausible—although statistically insignificant—seasonal effects: Zakat withdrawals and the window dressing around bonus dates. Yet much of this residual seasonality was further offset between deposit categories as savings are moved into current accounts or bankers check float, thus limiting liquidity outflow. Overall, weak seasonality and interproduct compensation effects are good news from a core deposit supply standpoint. That is because strong seasonal fluctuations would limit the utility of customer deposits for intermediation into earning assets of longer maturity. The peculiar problem with seasonality is that, if it applies to deposit supply, it is likely that loan demand might also be subject to a similar seasonal cycle that could aggravate the liquidity pressures (loan demand up, deposit supply down).

Aggregate balances move gradually

The autocorrelation coefficients that were calculated to determine the significance of annual seasonal cycles can also be interpreted in a different direction. In all cases and for all types of deposit products, very high autocorrelation coefficients were calculated for short lags of one or two months. This simply means, for example, that if this month's savings volume is high, then next month's value will very likely also be high. In other words, under normal business circumstances, aggregate balances are not prone to abrupt swings and reversals but move gradually and in clusters of adjacent points in the time series. This makes liquidity management easier, because it gives the bank time to adjust to the changes in deposit supply over several months.

No institution in the sample experienced a bank-specific run where one could have witnessed the falling apart of these business-as-usual assumptions about gradual changes in deposit supply. This was to be expected, because such events are rare and typically the institution does not live to tell the story. Victims of a depositor confidence crisis are sold or merged with other banks, or are closed and unwound by the regulator.

Deposit supply variations tend to be normally distributed

Data in all five cases, including even the very small BPR Kebomas, are compatible with the notion that aggregate deposit supply is atomistic enough such that the relative daily or monthly variations of actual balances net of a potential growth trend can be considered a normally distributed random variable. This is an important result, because it allows the institution to make plausible inferences about upper and lower boundaries of forward-looking deposit volumes with a certain probability in the sense of a confidence interval. The only parameter necessary to specify a confidence interval of deposit supply is the observed volatility of deposits.

Because the volatility and the derived confidence intervals describe observations of deposit fluctuations under normal and relatively benign business conditions, it is important to complement this analysis with a stress test. A stress test is based on rare and rather catastrophic circumstances, where previously observed patterns of behavior break down. Banks should regularly test how they would cope with a systemic liquidity shock or an institution-specific reputation event in which they might see a complete drawdown of unsecured interbank liabilities and a loss of perhaps 20 percent of customer deposits over 30 days. Because the unsecured money market typically dries up entirely in such a situation, the bank would have to be in a position to meet the run-off with existing liquid and liquidated assets.

In terms of specific volatility values, the benchmark figures from the large German bank illustrate perfectly the conventional wisdom about deposit behavior: savings deposits are the bedrock of funding with very low volatility and low interest cost. Term deposits are more volatile because of their higher concentration or "lumpiness" and the higher sensitivity to interest rates and reputational concerns. Current accounts are the most volatile because they are primarily held for transaction reasons and do not serve the purpose of accumulating funds.

Equity Bank and Allied Bank conform to this typical expectation on volatilities, but in VTB, BPR Kebomas, and BancoSol, term deposits are less volatile than ordinary savings accounts. One could speculate that this may be because their aggregate term deposits also are several times larger than the total balance supplied by ordinary savings. This likely also means that

bank staff pay particular attention to raising term deposits and liaising with the smaller circle of "elite" depositors, with the objective to manage down the inherent volatility of term deposits. Also, there is anecdotal evidence from many developing countries where small trading businesses often use savings accounts instead of designated current accounts for short-term safekeeping of relatively large amounts of physical cash that are deposited and withdrawn several times a week. Such atypical uses of savings accounts may distort the volatility in institutions with a microenterprise focus, such as BPR Kebomas and BancoSol.

Volatilities above 30 percent per annum appear quite high by international standards. Unless it is a sign of an immature deposit operation that has not yet established typical supply behaviors, one would have to conclude that the utility for longer term intermediation of these resources is very limited. Thirty percent volatility indicates that, with a confidence level of 95.4 percent, total deposits will not drop below -60 percent of the long-term trend within one year. This indicates that even under business-as-usual conditions (not a stress event) there is a 2.3 percent chance of dropping even lower. Therefore, one should not make housing loans with this type of deposit funding, but using possibly 50 percent of the balance for short-term micro-enterprise loans still seems acceptable.

Average life as an alternative measure of volatility

The results of the average life calculations for all five banks largely follow the relative volatilities among the product categories, which is in line with our interpretation of average life as an alternative measure of volatility. This measure is appealing simply because it expresses volatility in the intuitive dimension of days over a certain reference time horizon. Average life is also a useful concept for slotting deposits into a maturity gap table of all assets and liabilities that is sometimes part of regulatory reporting. By using the average life instead of the contractual maturity, which is typically "demand" for ordinary savings accounts, one can make the move from contractual to experiential maturity of liabilities. This often changes the perception of an institution as being short funded to one that is structurally long funded and thus much less liquidity risky than the contractual maturity gap would suggest.

Sensitivity of deposit supply to macro stress events is small

It is clear that a positive macro event will never lead to a sudden surge in deposits that could be attributed specifically to it. Mapping events to deposit patterns makes sense only for sudden bad news or disasters of a

broad-based nature that induce large numbers of depositors to try to get their money out while they still can. For some sociopolitical crisis events in some countries, but certainly not for all, coinciding drops in deposit supply were found. Natural disasters left no trace on deposit balances in any of the observations. Even where there existed a potential match on the timeline between a confidence-shattering stress event and a decline in deposits, there is no guarantee that there is indeed a causal link. There were always more undulations in the deposit time series than there were stress events that could have explained them. So, if other supply variations of the same size simply "happen" because of the random nature of the many underlying drivers of depositor behavior, then it seems inappropriate to give much credence to a causal link in those instances where a macro event does coincide with a drop in total deposits.

In fact, explaining deposit behavior with just a few macro events is an analytical dead end. This study did not attempt to build a true multidimensional predictive model of deposit supply, but it introduced some of the typical arguments such a model might take: the interest rate paid by the institution relative to competitor rates and other alternative investments is one immediately obvious input. But equally important are marketing expenditure, branch network, service features, customer demographics, employment, income growth, and so on. Constructing and back-testing such models require an institution-internal perspective and much deeper data access than was available. Statistically validated, multivariate regressions of deposit supply onto customer, institution, and competition data are the only way to get beyond the selective ad hoc retrofitting of events to observed supply trends. Otherwise, one falls into the same trap as many market commentaries, where "interest rate fears in Japan" or more recently "subprime credit worries" are bad news for the dollar and the next day are simply "shrugged off" or explain a rally in the same currency. We recommend that banks and MFIs in emerging and developing countries invest the effort in better modeling and understanding the behavior of their depositors in normal operating conditions as well as under stress circumstances. It is an essential survival skill in banking and will soon be equally relevant in the increasingly competitive world of microfinance.

Table 21: Cross-Institutional Summary with Large German Bank as Benchmark

	Allied Bank, Pakistan	VTB, Georgia	BPR Kebomas, Indonesia	Equity Bank, Kenya	BancoSol, Bolivia	For Comparison: German Bank
Institution Profile						
Type / Charter	Fully licensed commercial bank.	Fully licensed commercial bank.	Rural People's Credit Bank (BPR) with limited license for savings and loan operations.	Fully licensed commercial bank.	Fully licensed commercial bank.	Fully licensed commercial bank.
Supervised / Regulated by	State Bank of Pakistan	National Bank of Georgia	Bank Indonesia	Central Bank of Kenya	Superintendent of Banks and Financial Entities (SBEF) & Central Bank of Bolivia.	German Financial Markets Regulator (BaFin) & Bundesbank / European Central Bank.
Total Assets, Dec-2006, USD	$4.2 billion	$275 million	$641,000	$294 million	$231 million	Not disclosed.
Customer Deposits / Total Assets	81.7%	28.3%	59.0%	82.0%	66.4%	2002: 35%
Country Data						
GNI per Capita (Atlas Method)	$690	$1,350	$1,280	$530	$1,010	$34,580
Consumer Price Inflation % p.a. 2006	7.9%	10.0%	13.2%	10.5%	4.3%	1.7%
% of Population below $1/day	17.0%	6.5%	7.5%	22.8%	23.2%	n/a
% of Population below $2/day	73.6%	25.3%	52.4%	58.3%	42.2%	n/a
Institutional Time Series Evaluated						
Monthly Product Balances	Jan-96 to Jul-04	Jan-01 to May-04	Jan-01 to May-04 F	Nov-01 to Dec-06	Dec-98 to Dec-05	Sep-97 to Dec-02
Weekly Product Balances	Aug-04 to Oct-05	Jun-04 to May-05	Jun-04 to May-05	None	None	None
Daily Product Balances	Nov-05 - Nov-06	Jun-05 to May-06	Jun-05 to May-06	None	None	None
Demand Savings Accounts						
Number of Accounts	1.4 million	272,000	820	988,000	81,200	n/a
Total Balance Supplied (last)	$983 million	$6.58 million	$88,000	$172 million	$22.5 million	$5.2 billion
Currency Denomination	Pakistani Rupee	Georgian Lari (GEL), USD, EUR	Indonesian Rupiah	Kenyan Shilling (KES)	Boliviano (BOB) & USD	EUR
Average Balance per Account USD	$708	$23.77	$107	$174	$277	n/a
Average Balance as % of GNI per capita	102.6%	1.8%	8.4%	32.8%	27.4%	n/a
Interest Rate Paid	2.55% p.a.	GEL: 4% p.a., USD & EUR: 3% p.a.	7% p.a.	2-3% p.a.	BOB: 4.5% p.a.; USD: 1% p.a.	% p.a. - 3.5% p.a.
Current Accounts						
Number of Accounts	482,000	n/a	n/a	18,000	No data	n/a
Total Balance Supplied (last)	$911 million	n/a	n/a	$40.8 million	No data	$8.6 billion
Currency Denomination	Pakistani Rupee	n/a	n/a	KES	No data	EUR
Average Balance per Account USD	$1,891	n/a	n/a	$2,306	No data	n/a
Interest Rate Paid	None	n/a	n/a	None	No data	0% - 0.36% p.a.
Retail Term Deposits						
Number of Accounts	61,500	3,000	84	8300	4500	n/a
Total Balance Supplied (last)	$392 million	$30.9 million	$289,000	$27.3 million	$74.2 million	$7.9 billion
Currency Denomination	Rupee or foreign currency	Mostly USD	Indonesian Rupiah	KES & USD	BOB & USD	EUR
Average Balance per Account USD	$6,378	$10,317	$3,440	$3,275	$16,568	n/a
Interest Rates Paid	5% to 8% p.a. on Rupee deposits of up to $83,000 for up to 12 months	GEL: 6.5% - 12% p.a. for 3 - 24 months. USD: 4.5% - 10% for 3 - 24 months	18% p.a.	In KES: 4.10% p.a. to 7.75% p.a. for amounts up to $7,350 and tenors up to 12 months	BOB: 4.5% to 7% p.a.; USD: 1% to 5.5% p.a.	2.6% - 2.9% p.a.
Seasonality, Statistical Significance						
Demand Savings Accounts	Some residual annual-cycle seasonality on all three deposit categories due to Islamic holidays and Zakat effect	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Current Accounts		n/a	n/a	n/a	n/a	Insignificant
Retail Term Deposits		Insignificant	Insignificant	Not tested.	Not tested.	Insignificant
Annualized Volatility of Deposit Supply						
Demand Savings Accounts	13.51%	27.6% (GEL accts. only)	61.24%	14.43%	24.24%	4.39%
Current Accounts	40.89%	n/a	n/a	1.2012	n/a	0.1581
Retail Term Deposits	33.57%	6.73%	26.96%	34.50%	17.33%	11.88%
Days Average Life, two-year period						
Demand Savings Accounts	322	259	461	15	556	615
Current Accounts	245	n/a	n/a	9	n/a	526
Retail Term Deposits	216	538	568	13	600	597
Sensitivity to Macro-Events						
Political or Socio-Economic Crisis during Data Period?	Yes, several	Yes, several	Yes, several	Only minor political turbulence: Dec-02 general elections, constitutional referend m Dec 05	Yes, several	None. But special circumstances during euro introduction Jan-02
Large Natural Disaster during Data Period?	Yes, Kashmir earthquake Oct-05	No	Yes, Dec-04 Tsunami	Yes, drought in 2005	None	Yes, river Elbe flood Aug-02
Macro-Events Coincide with Decline in Deposit Supply?	Yes, May-Oct-99 Kargil (Kashmir) conflict; 9/11 & Afghanistan invasion Oct-01	Yes, Nov-03 to Mar-04 Rose Revolution	Yes, May-01 to Jul-01 President Wahid impeachment crisis; Jul-04 to Sep-04 presidential elections	No evidence found in Equity Bank data	Yes, Jul-02 system-wide liquidity crisis, Feb-03 unrest against Lozado govt., Apr-04 tax on financial transactions and gas referendum	No evidence of conspicuous drops in deposit supply. However, surge of deposits in Dec-01 ahead of DMEuro banknote conversion in Jan-02

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