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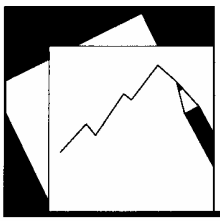

IMF Working Paper

Bank Consolidation and Performance: The Argentine Experience

Ritu Basu, Pablo Druck, David Marston, and Raul Susmel

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Bank Consolidation and Performance: The Argentine Experience

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Abstract

We examine a large panel of more than 100 banks from Argentina to study the effects of bank consolidation on performance between December 1995 and December 2000, a period of heavy bank consolidation and relative calm. Overall, we find a positive and significant effect of bank consolidation on bank performance. Bank returns increase with consolidation, and insolvency risk is reduced. Additionally, the study suggests that mergers and privatizations have a beneficial effect on bank returns. The effects of a bank acquisition on return on equity is, however, negative. Acquisitions do not seem to have any effect on risk-adjusted returns. The study also finds that a bank's insolvency risk is reduced significantly through mergers and privatization and is unrelated to bank acquisitions.

JEL Classification Numbers: G1, G2

Keywords: Bank Consolidation, Banking Industry in Emerging Markets, Financial Performance

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I. INTRODUCTION

Over the last decade, the international banking industry, particularly in emerging market economies, has undergone substantial structural changes. Particularly noticeable is the tendency toward consolidation, i.e., a reduction in the number of banks and other deposit-taking institutions with a simultaneous increase in size and concentration of the remaining entities in the sector.[2] Among other factors, these changes have been initiated and sustained by technological innovation, deregulation of financial services at the national level, opening up to international competition, changes in corporate behavior—such as growing disintermediation and increased emphasis on shareholder value (see Berger et al. (1999))—repeated episodes of banking sector crisis, and privatization of state-owned banks, especially in emerging market countries (see De Nicoló et al. (2003); Bank for International Settlements (2001); (International Monetary Fund (2001)).

These developments have generated substantial interest in the potential consequences of bank consolidation on performance. Several arguments have been made regarding the impact of increased size concentration on banking sector risks and returns. On the one hand, it is argued that consolidation could potentially increase bank returns, through revenue and cost efficiency gains, and that consolidation may reduce industry risks through the elimination of weak banks (especially after a banking crisis) and better diversification opportunities open to the remaining larger banks, (see Berger (2000)). On the other, it has also been argued that consolidation could increase the banks' propensity toward risk taking through increases in leverage and off-balance sheet operations (see Berger (2000); Demsetz, and Strahan (1997)). Also, scale economies are not unlimited as larger entities are usually more complex and costly to manage. Very large banks may become too big to fail, to liquidate, or to discipline effectively, with a consequent increase in moral hazard (and risk taking); reductions in competition, (and disincentives for efficiency improvements); and concentration in industry with undue capture of regulators and/or influence on government (De Nicoló et al. (2003)).

While there are a host of studies that have analyzed the impact of bank consolidation on performance in mature markets,[3] there have been few attempts to study this issue in the context of emerging market countries. Studies of the U.S. banking industry in the 1980s and early 1990s found mixed evidence of the impact of consolidation on financial firms' risk.[4]

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[2] See BIS (2001) report, Table 1.

[3] See Boyd and Runkle (1993), and De Nicoló (2000).

[4] See De Nicoló et al. (2003) for additional survey of literature in mature markets. A selection of the surveyed articles suggests mixed evidence. Benston, Hunter, and Wall (1995) found some evidence that risk diversification could be a motive for bank acquisitions. Comparing pre- and post-merger of a sample of U.S. bank holding company mergers, Craig and Santos (1997) found higher profitability and lower risk post-merger. Boyd and Graham (1998), however, found evidence of higher risk-seeking and failure rates for large banks in

(continued…)

Recent emerging market studies find that bank consolidation increases banking risk with limited impact on competition.[5] If we were to allow for different reasons for consolidation across mature and emerging markets, we could perhaps expect different impacts of consolidation on bank performance. Albeit, the performance outcome related to a crisis and privatization-driven consolidation (as in many emerging market economies) could be quite different from that driven by changes in corporate behavior (as in some mature economies).

In this paper we contribute to the limited literature on bank consolidation in emerging market economies, in particular, by studying the impact of consolidation on bank performance in Argentina. Specifically, using methodology similar to Demsetz and Strahan (1994) in their analysis of bank consolidation for the United States, we examine a large panel of more than 100 banks from Argentina to study the effects of bank consolidation on bank performance during the December 1995–December 2000 period.

In studying the effects of consolidation on performance, we study a variety of measures of bank performance, such as returns (measured using accounting data) and insolvency risk. Our findings suggest a beneficial effect of bank consolidation on performance. Bank returns increase with consolidation, and insolvency risk is reduced. Additionally, the study suggests that mergers and privatizations have a significant beneficial effect on bank returns. While a merger increases a bank's return on equity and risk-adjusted return on equity by 4.53 percentage points and 0.30 points, respectively, a privatization increases it by 23.1 percentage points and 2.3 points, respectively. The effects of a bank acquisition on return on equity is however negative, reducing it by 2.62 percentage points. Acquisitions do not seem to have any significant effect on risk-adjusted return. The study also finds that a bank's insolvency risk is reduced significantly through mergers and privatization, with

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the 1990s. More recently, Cebesoyan and Strahan (2002) find that increasingly sophisticated loan management practices by U.S. banks, usually associated with size and scope of their activities, do not reduce bank risk.

[5] Among recent studies, De Nicoló et al. (2003) analyze the extent to which financial firm risk and systemic risk potential of banks are related to consolidation and conglomeration. They find that rising international trends in conglomeration and consolidation increase risk profiles of large, conglomerate financial firms and enhances systemic risk potential for more concentrated banking systems. Martinez Peria and Mody (2004) study impact of increasing foreign participation and high concentration levels on bank spreads in Latin America during 1990s. While foreign banks were able to charge lower spreads relative to domestic banks, there was some offset on account of higher spreads and costs associated with concentration. Gelos and Roldos (2002) examine the evolution of market structure in emerging market banking systems. Their study, based on eight European and Latin American countries, seems to suggest that increased participation of foreign banks prevented decline in competitive pressures despite consolidation.

0.22 point and 0.51 point reductions, respectively. Again, bank acquisitions seemed to have no impact on insolvency risk.

The rest of the paper is organized as follows. Section II provides a brief description of the salient features of the consolidation process in the Argentine banking sector over the December 1995–December 2000 period. Section III discusses the econometric methodology in detail. Section IV describes our data set and discusses the challenges that arise in using this data to conduct our analysis. Section V presents the main findings. Section VI concludes.

II. Consolidation in the Argentine Banking System

A. The Fiscal-Driven Evolution of the Argentine Banking System

The Argentine banking system has undergone major structural changes over the past 20 years, but especially during the last decade. These structural changes largely reflect changes in the economic and political environment in Argentina, where the economy went from hyperinflation to some years of deflation, and the military gave way to a democratic government. To better understand the structural changes in Argentina's banking system, it is best to track the evolution of the banking sector against the background of these changes.

During the 1980s, Argentina had little or no access to the international capital markets due to the debt crisis sparked in 1982 by the default on external debt declared unilaterally by its government. Consequently, the government was forced to finance its deficits through monetary creation by the central bank, which led to several episodes of inflationary surges. In response to the inflationary pressures in the system, the government undertook several stabilization plans, including the Austral Plan in 1985 and Plan Primavera in 1987. Among other measures, the Austral price stabilization plan took aim at sterilizing part of the monetary emission by increasing the reserve requirements and paying competitive interest rates on them. This gave banks an incentive to collect deposits at a larger scale. Plan Primavera required that all reserve requirements for different kinds of deposits be substituted for two special government obligations remunerated at the average deposit rate of commercial banks plus a 0.5 percent monthly premium. This measure enabled banks to offer higher deposit rates to attract depositors. Although these sterilization measures gave commercial banks an incentive to collect and retain deposits by expanding their scope of operation, the increase in deposit intermediation was short-lived (see Fernandez (1990)).

The inability of the government to undertake rigorous fiscal reforms, together with interim sterilization actions to curb the inflationary process, soon generated large fiscal obligations and quasi-fiscal costs that brought the government to the brink of insolvency. After attempts to place fixed income instruments in the market had only resulted in a run on banks and the declaration of a bank holiday, the Argentinean government announced on January 1, 1990 its "Bonex Plan" to address the government's insolvency problem. It required the rescheduling of all domestic-currency-denominated bank certificates of deposits (CDs), excluding only savings accounts, sight deposits, and domestic public debt. Public debt instruments (mainly

held by banks) and term deposits were replaced by ten-year dollar-denominated bonds (BONEX) that would make semi-annual interest payments and had a two-year grace period. In a few days, the emergency bank holiday was lifted, and financial markets reopened. However, the rescheduling caused depositors large losses as they retained only the secondary market-traded value of BONEX holdings in lieu of their deposits. The government thus managed to avert a public sector and then banking sector meltdown by expropriating deposits and defaulting on domestic debt, that is, forcing depositors to bail it and the banking system out.[6]

The Argentine economy subsequently entered a period of hyperinflation. The real value of deposits plummeted to a historic low by the second quarter of 1990 and remained well below the previous ten-year levels until the introduction of the Convertibility Plan in March 1991. This plan established a currency board to fix the exchange rate at one to one with the U.S. dollar, deregulated domestic markets, liberalized trade, and began to privatize public services. The subsequent stabilization, together with changes in the Financial Intermediation Law that abolished the old deposit insurance system and established new rules for the closure and liquidation of financial institutions, attracted capital inflows and contributed to a marked recovery in financial intermediation. The ratio of broad money to GDP, which had declined from 25 percent of GDP in 1980 to less than 6 percent in 1990, rose to 20 percent by late 1994.

Triggered by the onset of the Mexican financial crisis (Tequila crisis), however, bank runs and capital flight erupted again in Argentina. Deposits fell by about 18 percent between November 1994 and March 1995, accompanied by shifts in deposits out of small banks into large banks and out of domestic into foreign banks (see Dabos and Mera (1998)). The government adopted measures to support liquidity and restructure banks,[7] but they met only partial success.

Only with the re-election of President Carlos Menem in May 1995 and the consequent introduction of reform measures did the bank runs stop and re-intermediation begin. The signing of the new IMF-supported program and other associated efforts also contributed to restore confidence.[8] By the end of August, almost half of the deposits withdrawn during the

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[6] See IMF: Sovereign Debt Restructurings and the Domestic Economy—Experience in Four Recent Cases (SM/02/67, 2/21/02).

[7] These included increased liquidity support through the lowering of reserve requirements on domestic (DCDs) and foreign (FCDs) currency deposits, establishing rediscount and repo facilities, and the creation of a trust fund for helping provincial banks with restructuring and privatization.

[8] The government sought large financial assistance from multilateral institutions and signed a new program with the International Monetary Fund. A trust fund for bank capitalization and a new deposit insurance scheme were established. The scheme covered DCDs and FCDs with

(continued…)

crisis had re-entered the banking system, but not always to the same banks they had fled. Most of the deposit refolds accrued to the fifteen-to-twenty largest banks, while most smaller banks had to continue to rely on liquidity support, and a number of small and wholesale banks disappeared altogether. Moreover, the proportion of total deposits held by foreign banks increased from 16 percent pre-crisis to 20 percent post-crisis. A reallocation from peso-to-dollar deposits also occurred, with the share of peso deposits in total deposits dropping from 49 percent in late 1994 to 44 percent when the re-intermediation process started.[9]

The resilience of the system during the Tequila crisis, combined with the increased role of foreign banks in the second half of the 1990s, contributed to a steady re-intermediation. Deposits remained flat or even increased during the Asian, Russian, and Brazilian crises, although pressures were felt on interest rates and deposits shifted from DCDs to FCDs. Also, consolidation and growth in the sector continued, driven largely by foreign banks.[10] It is this latter process and its impact on banking sector performance that we are interested in investigating in our paper.

B. Bank Consolidation in Numbers

The process of bank consolidation in Argentina was largely a consequence of these crises and the entry of foreign banks. While this has proved to be a common pattern in emerging markets, the proactive role that both the public and private sectors played in the consolidation is more unusual. Whether through the various reforms mentioned above or later attempts in the 1990s by the central bank to separate more troubled from less troubled banks and to sell the latter with the aid of subsidized loans, the government played a key role in closing or cleaning up problem banks. The main winners of this consolidation process have turned out to be the five largest banks (Gelos and Roldos (2002)).

We did not, in our empirical estimation, use threshold-based bank size (big and small) as a risk factor, but we did classify the banks into small banks (those with assets less than or equal to one percent of the market) and large banks (those with assets greater than one percent of the market) to study their evolution pattern graphically. Figures 1.A and 1.B show that during the analyzed period, large banks increased their market share in assets from 71 percent to 85 percent, while that of small banks dropped from 29 percent to 15 percent. Figure 1.C indicates that the large bank jump was driven by the largest of the large, those with an asset

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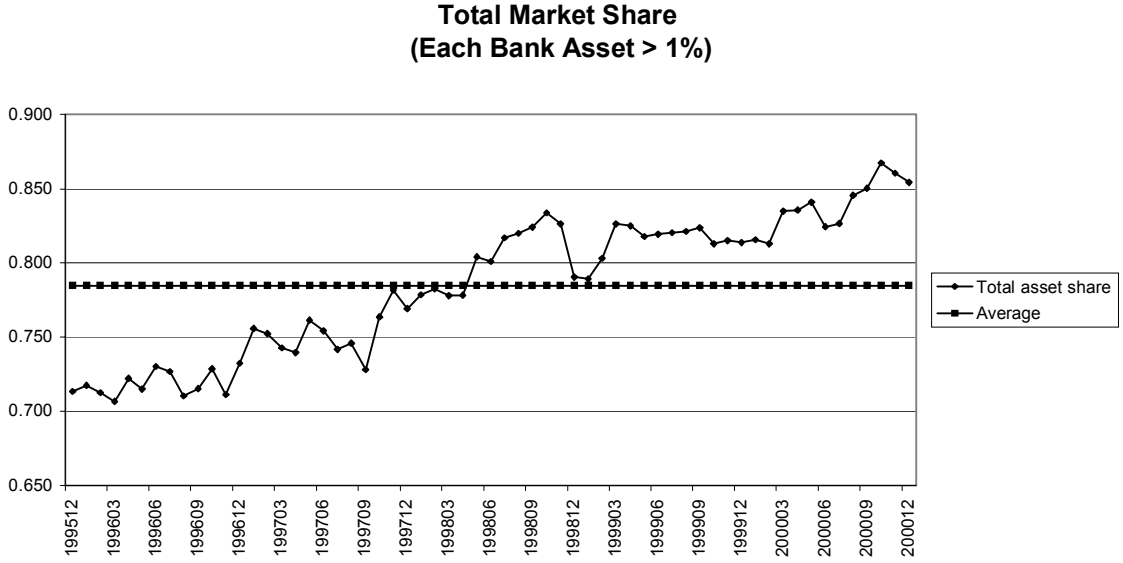
maturities of less than 90 days up to an amount of ARG$10,000 and time deposits up to ARG$ 20,000 (about 80 percent of accounts in the system).

[9] See *Financial Stability In Dollarized Economies*, IMF Occasional Paper No. 230 (2004).

[10] The share of system assets controlled by foreign institutions increased from 18 percent in 1994 to almost 50 percent by the end of 1999. (International Monetary Fund (2001)).

share of more than 5 percent, and that their great leap forward occurred in the first quarter of 1998. Figure 1.D shows that during the analyzed period, the number of small banks fell from 105 to 66 (a 37 percent loss). Figure 1.E shows that the number of large banks did not shift, but fluctuated around an average of 22. Figure 1.F shows that the largest of the large banks (more than 5 percent of total assets) jumped from 4 to 7, that jump occurring, again, in 1998.

Figure 1.A



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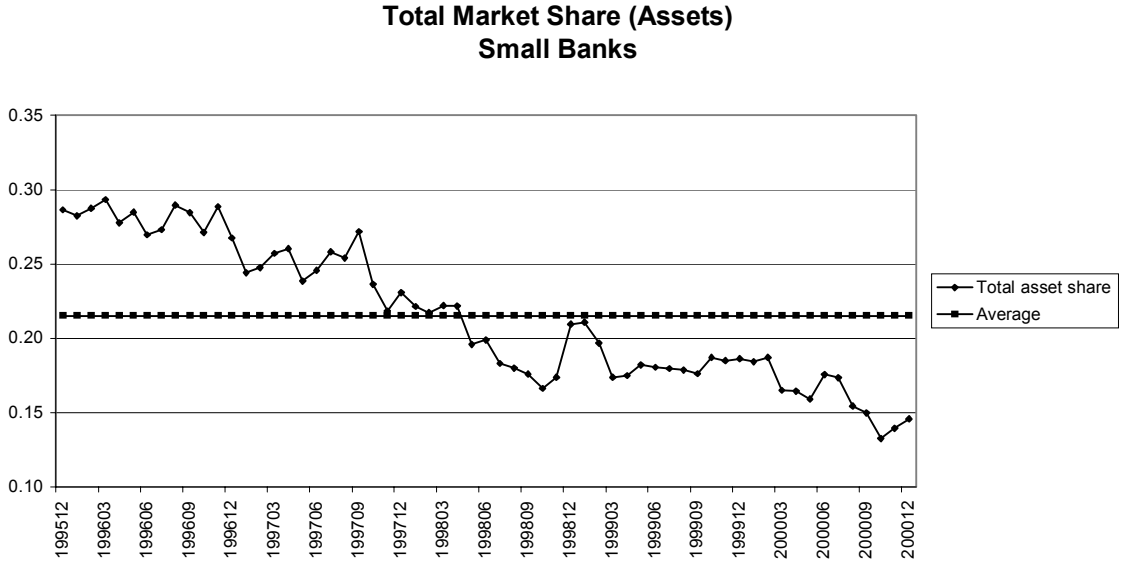

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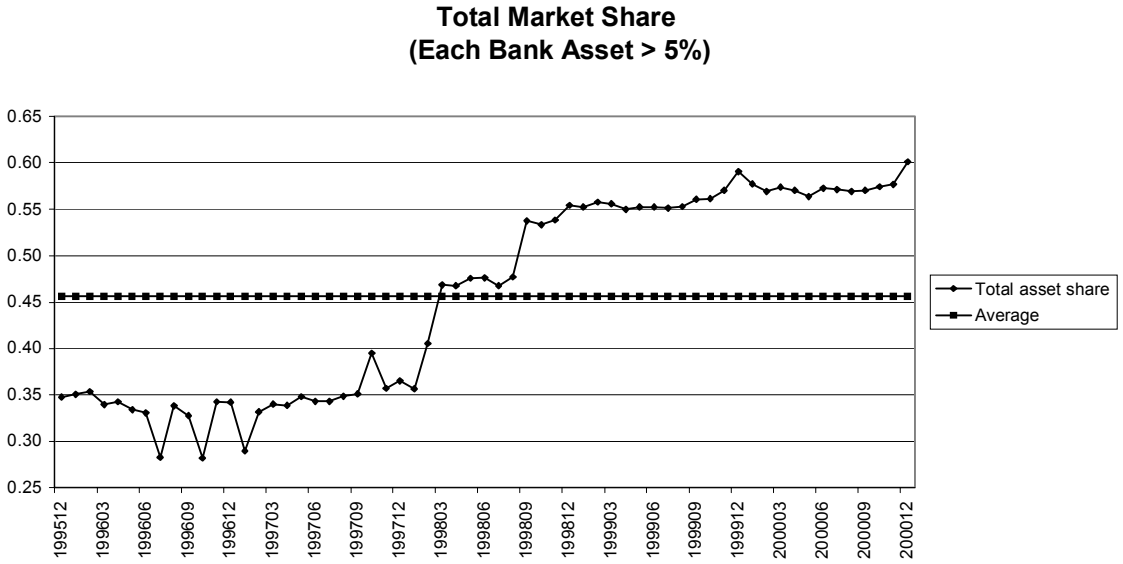

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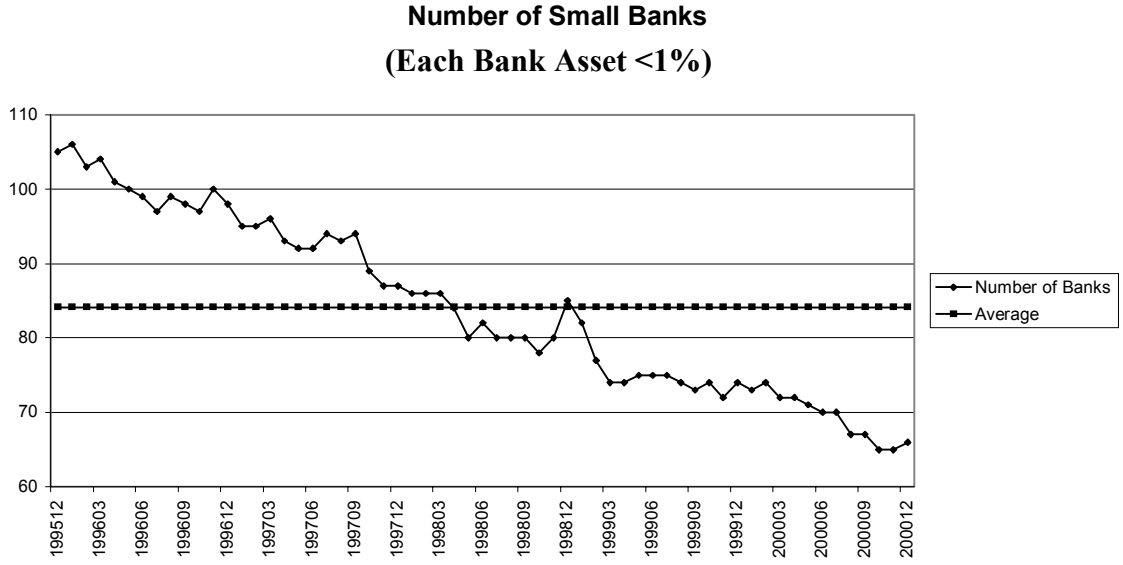

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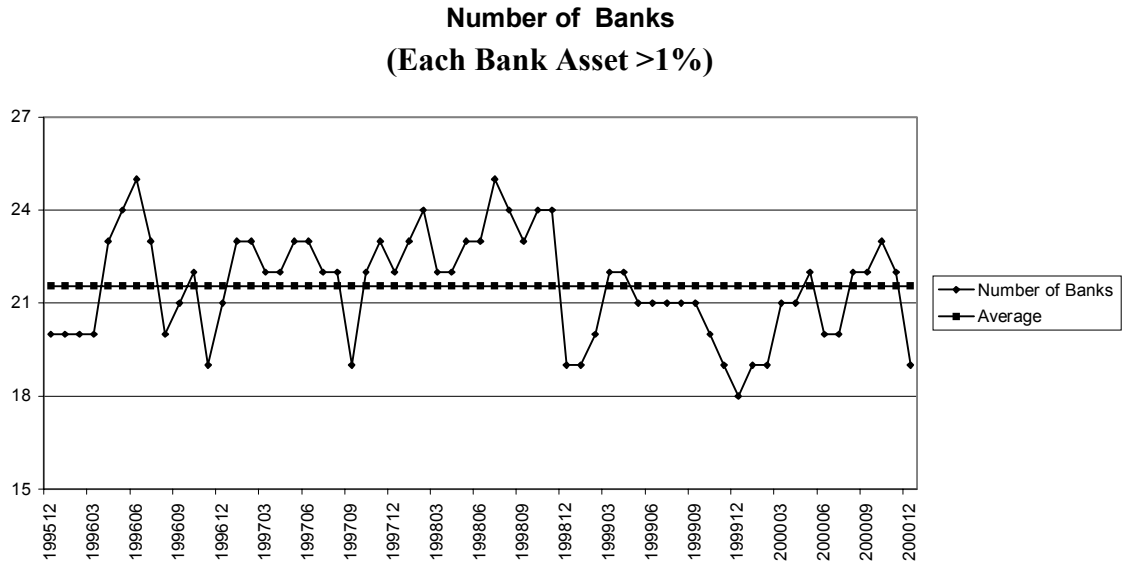
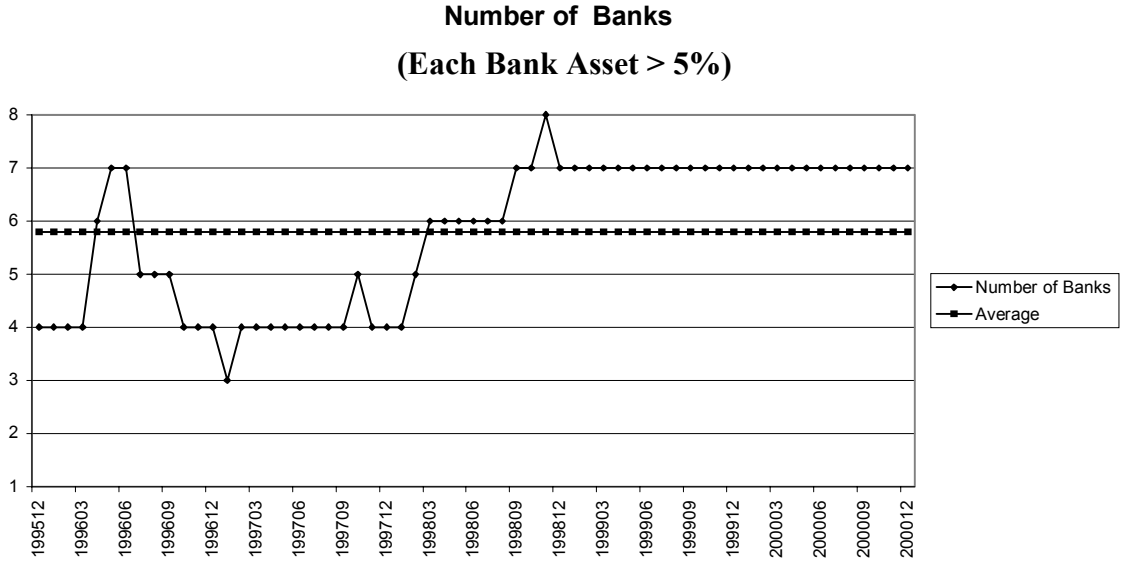


Figure 1.F



Looked at from an another point of view, during the period covered, the Argentine banking system experienced a structural change that reduced the number of banks by 27 percent, increased the amount of assets in that system by 20 percent, and left the number of branches largely the same. Large banks and the largest of the large banks seemed to be driving these changes, with the small banks often either being swallowed up or closing.

III. METHODOLOGY

A. The Econometric Method

The bank return generating process is given by the linear regression model:

$$r_{it} = \alpha + \mathbf{x}'_{it}\,\beta + u_{it}, \qquad (1)$$

where i denotes cross-sections and t denotes time-periods with i=1,2,...,N, and t=1,2,...,T. The dependent variable, r_{it}, denotes bank returns. α is a scalar, β is Kx1 vector of coefficients and $\mathbf{x}_{it}$ is the it-th observation on K explanatory variables or risk factors. There are different ways to model the error term u_{it}. Given the characteristic of our sample, we assume a fixed effect model, which specifies the error term as

$$u_{it} = \sum_{i=1}^{N} \mu_i D_i + \varepsilon_{it},$$

where D_i is a dummy variable for the i-th bank, and ε_{it} is the error term. To account for the potential presence of heteroscedasticity, we estimate model (1) using GLS. As a check for autocorrelation, we estimate model (1) with and without autocorrelation correction. We estimate model (1) using as bank returns the return on equity (ROE).[11] The vector of explanatory variables should include all bank risk factors. We have two distinctive bank risk factors: bank-specific (idiosyncratic) and macroeconomic risk factors. For the former, we use bank specific characteristics such as leverage, composition of loan portfolio (by type and sector), extent of bad loans and exposure to government debt (see Appendix I). We also include a set of dummy variables to indicate bank privatization, merger, acquisition, and disappearance from the sample. For the macroeconomic risk factors, we include country risk, industrial production, the ratio of a broad monetary aggregate to central bank reserves, and a liquid funds line available to the central bank (see Appendix I). Finally, in order to test the effect of bank consolidation on the return of banks, we include a variable degree of bank consolidation (a size-based measure). This variable can be considered a purely exogenous macroeconomic variable, but it can also be considered a micro (choice) bank variable. Equation (1) is similar to the model used in Demsetz and Strahan (1995), with some differences in estimation technique. They use a two-step process; first running a regression to

[11] We also used return on assets (ROA), with little difference in results.

filter out macroeconomic risks, and then estimating (1) using as independent variables the bank idiosyncratic risk. We estimate all the coefficients in a more efficient, one-step process. As a check of our results, and because of the many risk factors, we also reduce the number of explanatory variables using factor analysis, as suggested by Demsetz and Strahan (1995). That is, our model is

$$r_{it} = \alpha + \mathbf{f'}_t \boldsymbol{\delta} + \mathbf{x'}_{it} \boldsymbol{\beta} + u_{it}, \qquad (2)$$

where the $\mathbf{f}_t$ is a Lx1 vector of factors and the $\mathbf{x}_{it}$ is a Mx1 vector that now refers specifically to bank-specific risk factors. Model (2) is estimated in a two-step procedure. First, we reduce the number of explanatory variables using factor analysis; then, we estimate the factors f_{it}. Finally, we plug the estimated factors in (2) and estimate the model using GLS.

In order to indirectly test the effect of bank consolidation on bank returns, we check its effect on the Sharpe ratio, that is, the risk-adjusted returns. Such a return/variance ratio should also be affected by the risk factors discussed in (1). We estimate the following model:

$$r_{it}/\sigma^2_{it} = \alpha + \mathbf{x'}_{it} \boldsymbol{\beta} + u_{it}. \qquad (3)$$

We estimate the variance of bank returns using a time-series approach. We estimate individual GARCH (1,1) models for each bank. From this first step, we obtain estimates of the variance of bank returns, which we use, once divided by bank returns, as the dependent variable in model (3).[12] The right-hand side includes also the variance of bank returns to control the bank's position in the efficient frontier, where this variance is incorporated as an instrumental variable.

Many bank and macroeconomic variables display the usual unit root behavior associated with time-series aggregates. Dickey-Fuller tests cannot reject the null hypothesis of a unit root for all macroeconomic series, except the production index, at the one percent level. Thus, to avoid the usual problems associated with unit roots, we difference all the unit root variables.

As we mentioned above, bank consolidation can be considered exogenous (macroeconomic) or endogenous (microeconomic). To check the specification of our model and the treatment of bank consolidation as exogenous to the return-generating process, we also check for time-series causality between degree of bank consolidation and our dependent variables in (1) and (2). Granger-causality tests show weak evidence for causality between the dependent variables and bank consolidation.

To check the effect of the unbalanced feature of our panel, we estimate models (1) and (2) using only banks that are in the sample from December 1995 to December 2000. This

[12] As a crude check of our time-series results, we use a second, more heterodox approach, which employs rolling estimates of the variance in model (3).

reduces the sample to 50 banks and eliminates the dummy variable associated with the disappearance of the bank from the sample.

Next, we estimate a modified model (3) by replacing the Sharpe ratio with a measure for insolvency risk for the banking industry, and retaining on the right-hand side only the macro and bank-specific risk factors as controls. The insolvency risk variable Z-ROA was constructed using the De Nicoló (2000) framework. Appendix II provides a more detailed description about the Z-ROA construct, which measures the number of standard deviations a return has to fall in order to deplete the equity of the given bank. A higher value of this variable implies lower insolvency risk.

IV. DATA

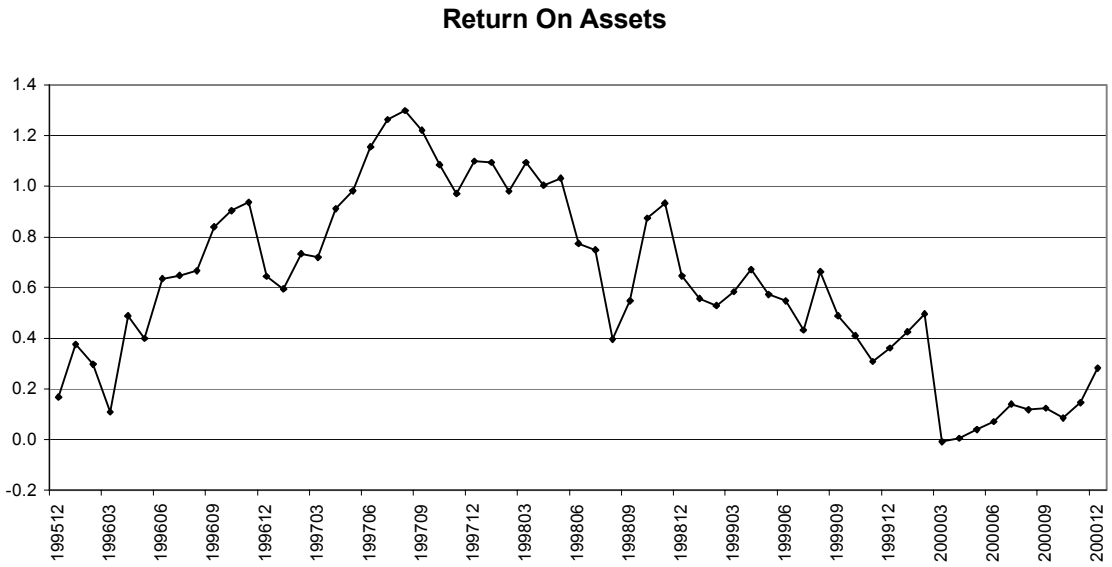
We collected monthly balance sheet data for more than 100 Argentine banks, with each balance sheet reporting more than 100 items. (Appendix I details the set of variables used in our analysis.) The data includes information on private, public, and foreign banks and covers the period from December 1995 to December 2000.[13] We ran the data through two filters; banks with missing key variables for more than six continuous months, and banks with less than six observations were dropped from the panel. The remaining banks and data generated our working database, an unbalanced panel. The total number of banks left in the sample is 98, with a total number of 4,742 observations in the panel. Because this was a period of heavy bank consolidation, not all banks have observations throughout the whole period. We lose some, and we gain some (because of new banks entry). We also work with a balanced panel, which incorporates only the banks that have observations from December 1995 to December 2000, mostly healthy banks. There are only 50 banks and 3,947 observations in the balanced panel.

The dependent variable measures bank performance. We use several bank performance indicators: return on asset/equity (ROA/ROE), ROE adjusted for return variance (Z-ROE), and a variable indicating the degree of banking sector solvency (Z-ROA). The multiple accounting-based performance variables are meant to compensate for the lack of market-determined performance measures.

Figures 2.A to 2.C show the evolution of ROA for all banks, small banks, and large banks, respectively, and Figures 3.A to 3.C show the time series of ROE for all banks, small banks, and large banks, respectively. Both series show a rise at the beginning, a dip at the time of the Russian crises (mid-1998) and then growth again from March 2000. The initial growth seems to be due to improvement in the returns of small banks, and the subsequent fall seems to be due to a strong decline in returns for large banks. Judging from their ROE, small banks seem to have been unprofitable through the first two years of the period, which may have

[13] The data was made available by the Superintendent of Financial Institutions, Central Bank of Argentina.

Figure 2.A



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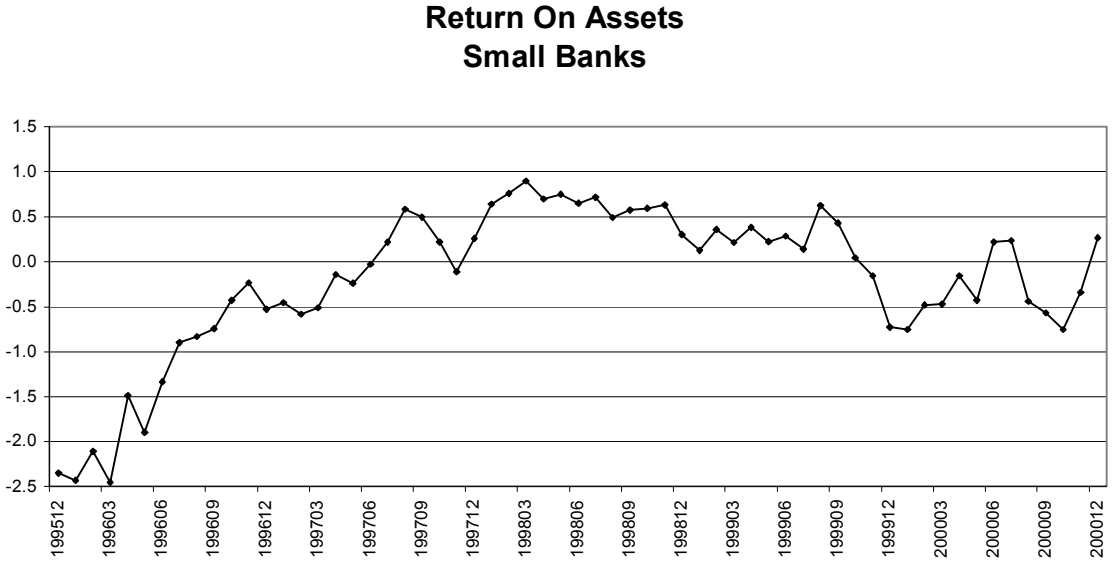

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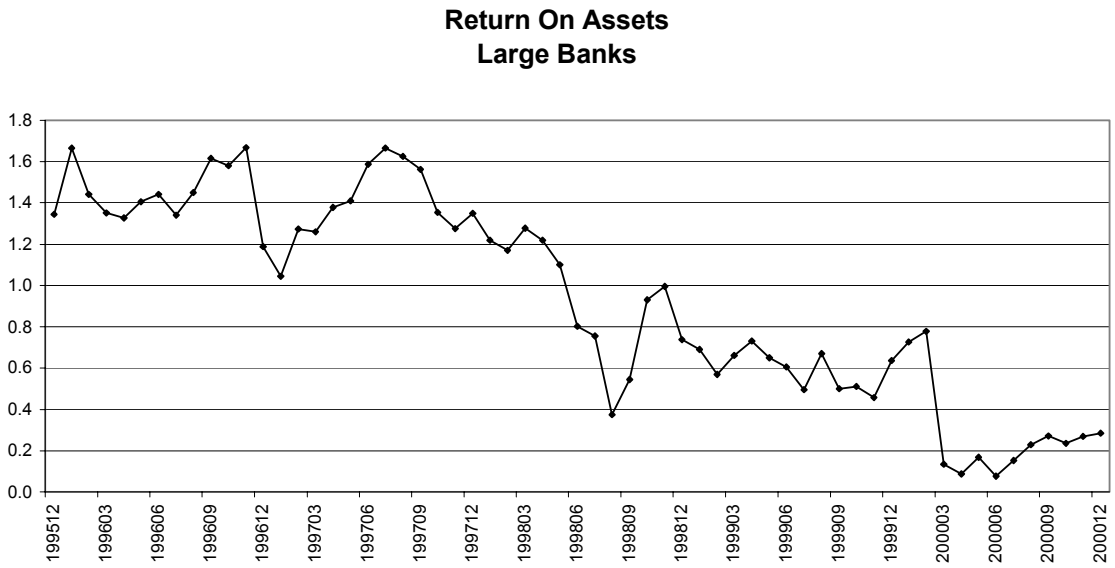
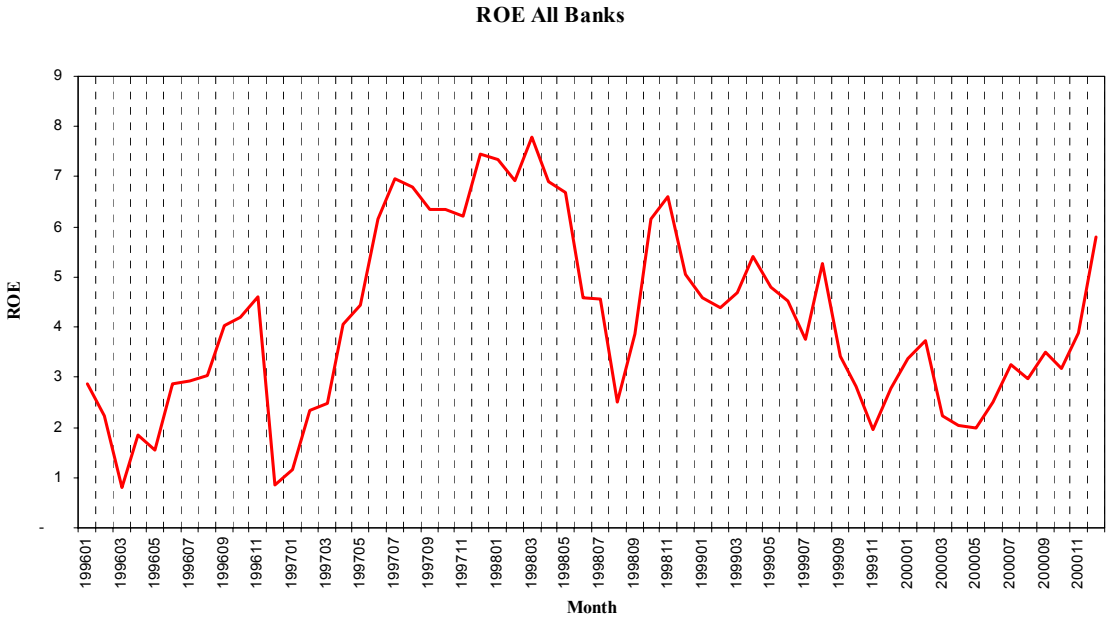


Figure 3.A



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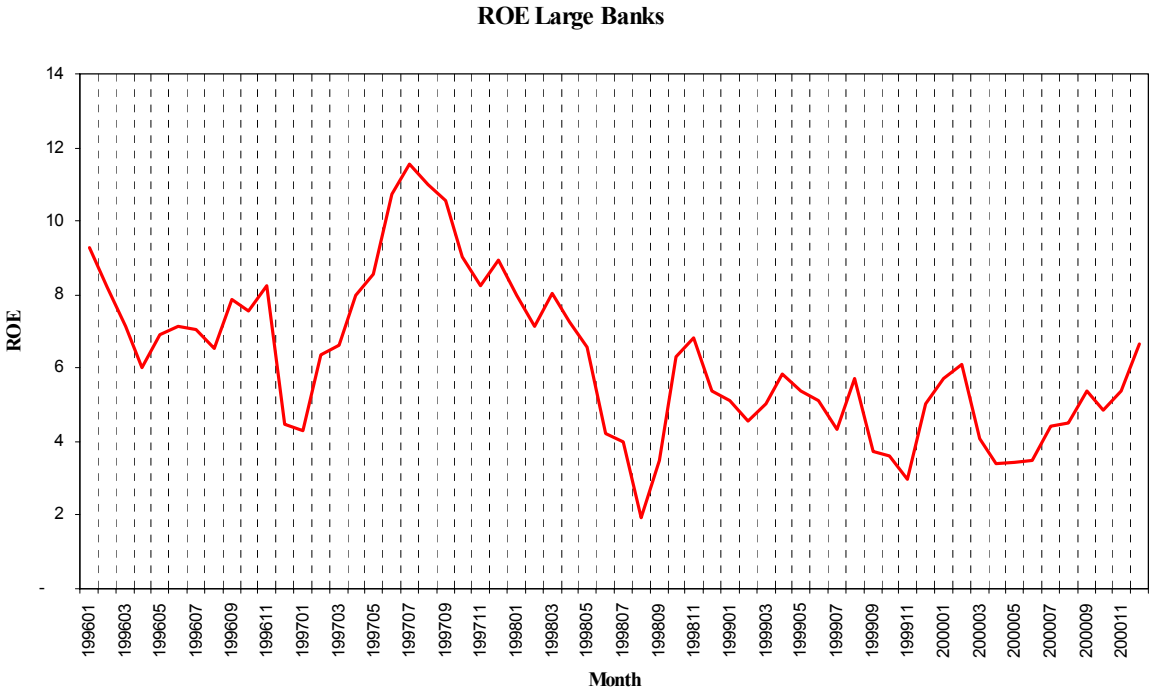

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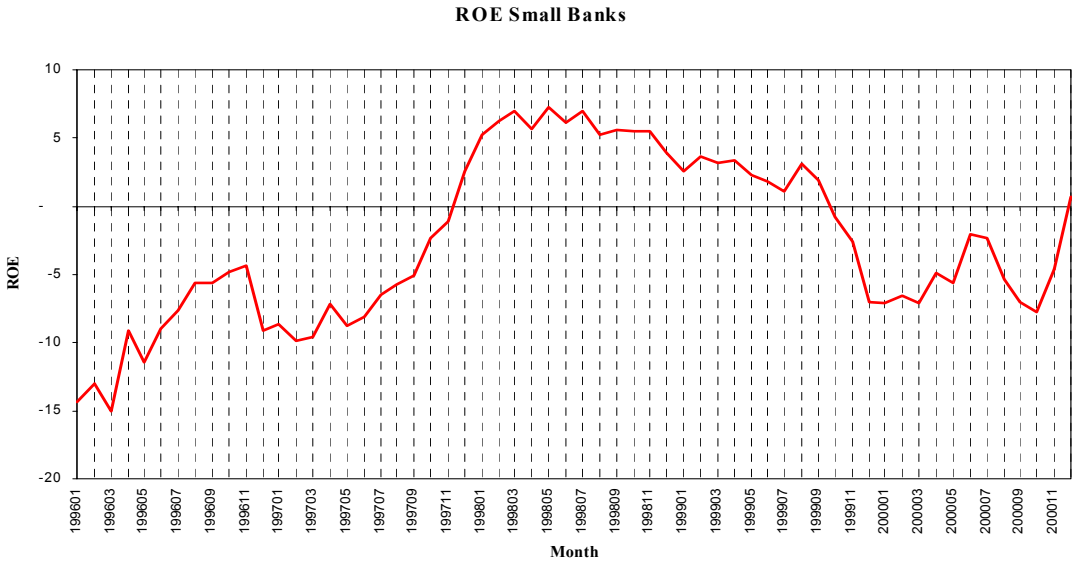

played a role in motivating the consolidation process. That consolidation process may account for some of the later large bank decline in ROA, since the acquired assets would dilute that number.

Figure 4 traces the insolvency risk pattern of the banking system, as measured by the Z-score index for ROA (Z-ROA). The patterns are irregular and highly volatile.

Bank consolidation, *shaset*, the key independent variable in this analysis, is a bank's share of the total assets of the banking industry. We prefer this way of measuring consolidation to one that involves thresholds, since the choice of cut offs is inevitably arbitrary. We have also incorporated two sets of independent variables to represent risk factors in the bank-return generating equation—one macroeconomic, one bank-specific. The former set includes a country risk index, an economic growth index, a central bank reserves index (broad money to international reserve ratio), and an index of liquid private sector funds available to the central bank. The latter set includes a bank loan-portfolio diversification index, a bank leverage measure, a measure of a bank's holdings of government bonds, a measure of a bank's exposure to bad loans, and measures of different loan holdings by category (mimicking diversification by loan type). Appendix I provides a more precise description of the variables selected for our analysis and discusses the rationale for their selection and the expected impact of these variables on bank performance indicators and the consolidation variable.

Table 1 lists the means and standard deviations of the bank-specific risk factors. The correlation analysis in Table 2 suggests a strong association between the bank performance variables and bank consolidation. It appears that consolidation is associated with enhanced banking sector performance (ROE and Z-ROE) and lower solvency risk (Z-ROA). Typically, a positive risk factor (negative risk factor) would be negatively (positively) correlated with the performance indicators ROE, Z-ROE, and Z-ROA. Since a higher value of Z-ROA implies reduced solvency risk, a negative correlation of a country risk (a positive risk factor) with Z-ROA implies that higher country risk raises the default probability or solvency risk of the banking sector. We observe these results consistently for risk factors involving diversification, the holding of government bonds, leverage, and nonperforming loans.

The correlation-based analysis suggests a strong positive association of consolidation with better bank performance. It also suggests that there are other factors, both macroeconomic and bank-specific, that affect bank performance. To better analyze the impact of consolidation, we turn to a more formal regression analysis in the next section.

V. RESULTS

Table 3 reports the GLS estimation of model (1) for the whole panel, applying a unit root correction to the independent variables when necessary. As macroeconomic independent variables we use country risk (CRisk), industrial production index (Emi), available liquid funds (Repo), and central bank reserves (M3/res). We also include four dummy variables: a merger dummy (DMerger), an acquisition dummy (DAcquis), a privatization dummy (DPrivat), and a disappearance dummy (DDisapp). Overall, the estimated signs are as

Figure 4

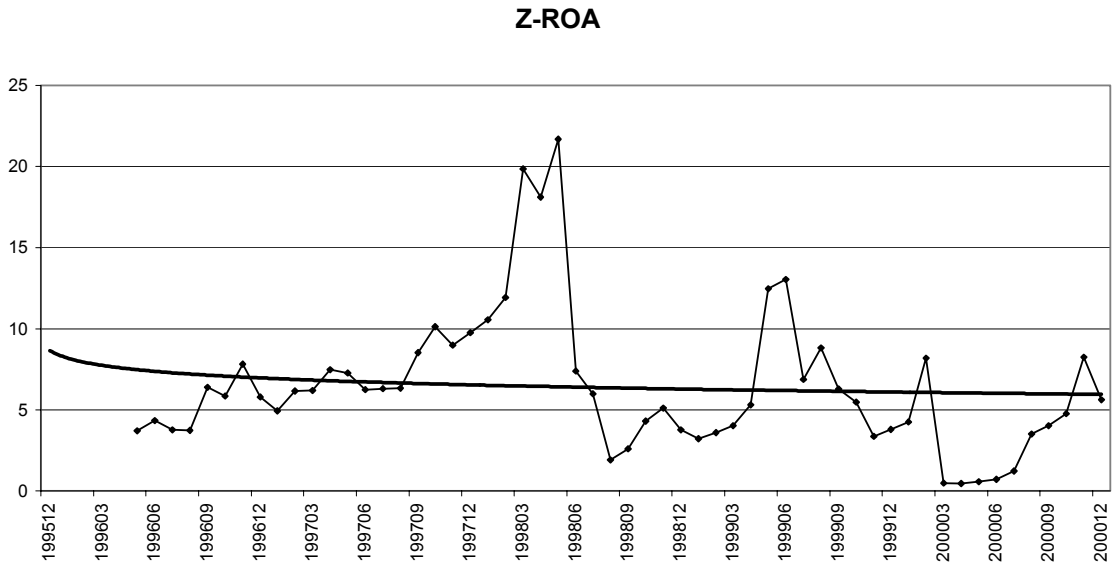

Table 1. Summary of Statistics

Variable	Mean	Standard Deviation
ROE (in percent)	4.04	1.90
ROA (in percent)	0.61	0.35
Crisk (basis points)	612.75	175.64
Emi (index)	110.58	8.68
Repo (in percent)	36.09	5.91
M3res	3.03	0.15
Shaset	0.01	0.02
NPL/Loan (in percent)	8.03	1.56
Lev (in percent)	905.46	183.58
Govbond	0.29	0.03
Rsloan	0.10	0.01
Aloan	0.08	0.01
Dsfloan	0.12	0.02
Ploan	0.03	0.01
Perloan	0.11	0.01

Table 2. Correlation Analysis: Unbalanced Panel

	Roe	Roa	Z-Roe	Z-Roa
Shaset	0.11 * (0.00)	0.11 * (0.00)	0.16 * (0.00)	0.89 * (0.00)

	Roe	Roa	Z-Roe	Z-Roa
Crisk	-0.02 (0.18)	-0.04 (0.00)	-0.06* (0.00)	-0.04* (0.00)
Emi	0.05* (0.00)	0.05 (0.00)	0.02 (0.26)	0.01 (0.55)
Repo	0.08* (0.00)	0.05 (0.00)	0.01 (0.43)	0.02 (0.29)
Div1	-0.20* (0.00)	-0.38* (0.00)	-0.14* (0.00)	-0.14* (0.00)
M3res	-0.09* (0.00)	-0.06 (0.00)	-0.02 (0.25)	-0.02 (0.11)
Factor 1	0.02 (0.12)	-0.01 (0.57)	-0.07* (0.00)	-0.06* (0.00)
NPL	-0.47* (0.00)	-0.47 (0.00)	-0.37* (0.00)	-0.38* (0.00)
Lev	-0.35* (0.00)	-0.14 (0.00)	-0.16* (0.00)	-0.18* (0.00)
Govbond	0.01 (0.30)	0.50 (0.00)	-0.01 (0.57)	-0.04* (0.00)
Rsloan	0.03* (0.02)	0.07 (0.00)	0.02 (0.19)	0.01 (0.33)
Aloan	-0.02 (0.21)	0.02 (0.19)	-0.01 (0.34)	-0.01 (0.70)
dsfloan	-0.14* (0.00)	-0.16 (0.00)	-0.01 (0.99)	0.05* (0.00)
Ploan	-0.16* (0.00)	-0.24 (0.00)	-0.19* (0.00)	-0.19* (0.00)
perloan	0.02 0.17	-0.01 (0.46)	-0.04* (0.01)	-0.05* (0.00)

Notes: * Implies significance at 5 percent level. Standard errors in parenthesis.

Table 3. Feasible GLS Estimates with Unit Root Correction:
Dependent Variable: ROE Unbalanced Panel

	One step GLS	One step GLS with Principal Component
Const.	-0.388 (-0.19)	-0.033 (-0.06)
Ch_Crisk	-2.699* (-2.80)	
Emi	0.028 (1.49)	
Ch_repo	0.173 (1.81)	
Ch_M3res	-1.312 (-0.54)	
Ch_Factor1		2.26e-07* (5.07)
Ch_shaset	7.363* (4.14)	7.170* (4.06)
Ch_Div1	-5.516* (-3.26)	-5.280* (-3.09)
Ch_NPL	-0.047 (-0.42)	-0.052* (-0.46)
Ch_lev	-5.67* (-5.01)	-5.480* (-4.87)
Ch_Govbond	6.064 (1.75)	5.749 (1.64)
Ch_rsloan	20.461 (0.95)	18.952 (0.89)
Ch_aloan	18.242* (1.97)	17.039 (1.85)
Ch_dsfloan	13.707* (2.29)	13.611* (2.23)
Ch_ploan	0.926 (0.03)	3.701 (0.13)
Ch_peloan	9.795 (1.01)	8.574 (0.88)
DMerger	4.53* (9.54)	4.682* (9.48)
DAcqui	-2.615* (-2.51)	-2.693* (-2.61)
DPrivat	23.077* (11.20)	22.889* (11.12)
DDisapp	-4.47* (-7.64)	-4.01* (-6.56)
No. obs.	4,742	4,742

Note: * Significant at the 5 percent level.
T-statistics in parenthesis.

expected. For example, an increase in country risk and an increase in leverage have a negative impact on the return on equity. More importantly, the estimation shows a positive and significant impact of bank consolidation on return on equity. All four dummies are highly significant. In general, the estimated signs of the dummy variables support the hypothesis of improved performance through consolidation. Both bank mergers and privatizations correlate positively with return on equity: both acquisitions and bank disappearance correlate negatively with return on equity. That bank disappearance is negatively signed should not be surprising, since poor performance leads to bankruptcy and bankruptcy to permanent disappearance. The negative correlation of acquisitions with bank returns is more surprising—we might suspect that the central bank may have been forcing healthy banks to acquire unhealthy ones.

The third column of Table 3 shows the result from a GLS estimation of model (1) after reducing the number of macroeconomic variables with factor analysis. We extract one factor and then use this factor as an exogenous variable in the GLS panel estimation. The factor loads with a negative sign for country risk and central bank reserves and with a positive sign for the other macroeconomic variables. The impact of the macroeconomic factor is significant and positive. The estimated coefficients of all other variables are largely unchanged from the second column.

Table 4 reports the GLS estimation of model (1) for the whole panel, without unit root correction. The type of estimation is the usual one in the consolidation literature, for example, in Demsetz and Strahan (1995). As in Table 3, we report two estimations, using GLS and GLS with a prior factor analysis extraction. The results concerning the effect of bank consolidation on return on equity are consistent with the results reported in Table 3. However, given the multi-correlation of the dependent variables, these results are worth looking at more carefully. Note that the t-statistics are greatly inflated and some estimated signs differ from those in Table 3. For example, here the effect of the available liquid funds measure on return on equity is negative and highly significant, while in Table 3, that effect is positive and non-significant at the standard 5 percent level.[14]

Table 5 reports the GLS estimation results of model (3), incorporating the unit root correction for all the relevant variables. The dependent variable, the Sharpe ratio (Z-ROE), is defined as the return on equity over the variance of return on equity. In this specification, the collateralized loans variable (ploan/*prendarios*) is dropped due to collinearity considerations. The time series of variances is estimated for each bank using a GARCH (1,1) model.

[14] As an additional check, we also estimate a two-step regression, following Demsetz and Strahan (1995). That is, first we run return on equity on the macroeconomic variables, and then we run the residuals on the bank-specific variables and bank consolidation. The results are very similar to the ones discussed above, and, thus, we do not report them.

Table 4. Feasible GLS Estimates Without Unit Root Correction:
Dependent Variable: ROE
Unbalanced Panel

	One Step GLS	One step GLS with Principal Component
Const.	33.552* (3.83)	8.810* (14.10)
Crisk	-0.004* (-5.43)	
Emi	0.021* (1.32)	
Repo	-0.177* (-3.32)	
M3res	-6.342* (-3.06)	
Factor1		-4.05e-09* (-7.02)
Shaset	77.258* (14.14)	74.324* (14.31)
Div1	-2.602* (-7.42)	-2.585* (-7.57)
NPL	-0.875* (-40.23)	-0.892* (-42.74)
Lev	-0.007* (-18.98)	-0.006* (-18.20)
Govbond	15.486* (16.25)	16.717* (16.97)
Rsloan	24.288* (12.33)	25.485* (12.97)
Aloan	16.102* (11.23)	15.19* (12.25)
Dsfloan	-3.275* (-3.53)	-3.082* (-3.106)
Ploan	-9.576* (-2.78)	-9.794* (-2.94)
Perloan	13.889* (11.67)	14.129* (11.36)
Dmerger	1.448* (3.60)	1.805* (4.62)
Dacqui	-1.927* (-3.59)	-1.202* (-2.29)
Dprivat	10.795* (8.99)	10.57* (8.88)
Ddisapp	-1.724* (-3.60)	-2.098* (-4.46)
Chi-sq.		
No. obs.	4,743	4,743

Note: * Significant at the 5 percent level. T-statistics in parenthesis.

Table 5. Feasible GLS Estimates with Unit Root Correction:
Dependent Variable: Z-ROE
Unbalanced Panel

	One Step GLS	One step GLS with Principal Component
Const.	1.48 (1.94)	2.01* (2.23)
Ch_Crisk	-0.24* (-2.97)	
Emi	0.01* (2.62)	
Ch_repo	0.01 (1.22)	
Ch_M3res	-0.10 (-0.50)	
Sdroehat	-0.13 (-1.73)	-0.15 (-1.81)
Ch_Factor1		1.08e-08* (2.45)
Ch_shaset	0.65* (4.93)	0.65* (4.93)
Ch_Div1	-0.48* (-3.77)	-0.46* (-3.57)
Ch_NPL	-0.01 (-0.78)	-0.01 (-0.97)
Ch_lev	-0.44* (-5.85)	-0.43* (-5.66)
Ch_Govbond	0.30 (1.18)	0.27 (1.08)
Ch_rsloan	-0.12 (-0.06)	-0.24 (-0.12)
Ch_aloan	2.05* (2.09)	2.04* (2.07)
Ch_dsfloan	1.86* (2.94)	1.92* (3.03)
Ch_ploan	Dropped due to collinearity	Dropped due to collinearity
Ch_peloan	-0.16 (-0.22)	-0.20 (-0.27)
Dmerger	0.30* (5.18)	0.30* (5.00)
Dacqui	0.15 (0.74)	0.17 (0.82)
Dprivat	2.26* (2.26)	2.42* (2.32)
Ddisapp	1.02 (1.23)	1.15 (1.33)
Log likelihood	-5,410.10	-5,414.40
No. obs.	4,372	4,372

Note: * Significant at the 5 percent level.
T-statistics in parenthesis.

The results in Table 5 are consistent, overall, with those in Table 3. Bank consolidation (a positive change in *shaset*) again significantly increases risk-adjusted returns. Most variables maintain their estimated signs, for example, the bank-specific variable on loan concentration (Ch_Div1) has a negative and significant effect on Z-ROE, while the bank-specific variable leverage (Lev) has a negative and slightly weaker effect on the Z-ROE. Also, the dummy variables for merger and privatization are significant and positive. On the other hand, with some bank-specific factors—real estate loans (ch_rsloan), personal loans (ch_peloan), and the bank acquisition dummy (DAcqui)—the signs are the reverse of those in Table 3. However, none of the estimated coefficients for these variables is significant. The estimated coefficients of the dummy variables support a relation between bank consolidation and risk-adjusted returns. We can reject the null hypothesis that bank consolidation, at least through mergers and bank privatization channels, has no effect on Z-ROE. Overall, the findings on the dummies and the significance of *shashet* suggest that bank consolidation increases the Sharpe ratio.

Table 6 reports the GLS estimation of a modified model (3), applying unit root correction to the relevant variables. The dependent variable, insolvency risk (Z-ROA), is defined in Appendix II. The time series of variances is estimated for each bank using a GARCH (1,1) model. The results in Table 6 are consistent, overall, with those in Table 3. For example, both the macroeconomic variable of country risk and the bank-specific variable of leverage have negative and significant effects on the Z-ROA. The dummy variables, except for the acquisition dummy, are significant, and their estimated coefficients support a relation between bank consolidation and solvency risk. We can reject at the 5 percent level the null hypothesis that bank consolidation has no effect on a bank's solvency. That is, bank consolidation significantly reduces the solvency risk.

When we estimate model (1), applying unit root correction to the balanced panel, the results are significantly weaker. Although the estimated coefficient for *shaset* is positive, the consolidation variable has no significant effect on bank returns. Only country risk and the bank merger dummy variable tend to be significant for different specifications. We also estimate model (3) for Z-ROA using the balanced panel. Again, we find a positive but insignificant effect of bank consolidation on bank insolvency. However, more risk factor variables are significant for the Z-ROA balanced panel estimation. Country risk, portfolio diversification, leverage, and the merger and acquisition dummies are significant—they also have the expected signs. Note that the significance of the dummy variables supports an indirect evidence of positive effect of bank consolidation on bank returns.

Why does bank consolidation fail to effect bank returns on the balanced panel? By balancing the panel, we lose 49 percent of the banks and 38 percent of the observations. And, as the estimated (in the unbalanced panel analysis) signs on the dummy variables of disappearances and acquisitions suggest, consolidation tends to wipe out many of the banks with lower performance measures. That is, balancing the panel chases out the banks that benefit the most from bank consolidation—the underperforming banks. In statistical terms, average bank returns increase, while the bank consolidation variable remains constant. Therefore, the correlation between bank returns and bank consolidation gets weaker.

Table 6. Feasible GLS Estimates with Unit Root Correction:
Dependent Variable: Z-ROA
Unbalanced Panel

	One step GLS	One step GLS with Principal Component
Const.	0.414* (2.56)	0.488* (11.11)
Ch_Crisk	-0.171* (-2.33)	
Emi	(0.00)2 (1.25)	
Ch_repo	0.015* (1.99)	
Ch_M3res	-0.038 (-0.19)	
Ch_Factor1		1.12e-08* (3.18)
Ch_shaset	0.598* (4.57)	0.591* (4.56)
Ch_Div1	-0.635* (-5.46)	-0.632* (-5.41)
Ch_NPL	-0.004 (-0.55)	-0.004 (-0.62)
Ch_lev	-0.587* (-8.02)	-0.589* (-8.08)
Ch_Govbond	0.376 (1.51)	0.363 (1.46)
Ch_rsloan	1.677 (1.33)	-1.657 (-1.31)
Ch_aloan	0.96 (1.43)	0.875 (1.29)
Ch_dsfloan	1.367* (2.21)	1.399* (2.26)
Ch_ploan	3.123 (1.76)	3.222 (1.833)
Ch_peloan	-0.679 (-0.98)	-0.737 (-1.06)
DMerger	0.224* (9.54)	0.217* (9.04)
DAcqui	-0.094 (-1.62)	-0.108 (-1.86)
DPrivat	0.511* (10.91)	0.509* (10.92)
DDisapp	-0.319* (-8.91)	-0.326* (-9.06)
No. obs.	4,372	4,372

Note: * Significant at the 5 percent level.
T-statistics in parenthesis.

Therefore, it seems that the big effect of bank consolidation is the disappearance of the small and weak banks from the sample. However, the elimination of weak banks is part of the consolidation process.

VI. CONCLUSIONS

We examine a large panel of more than 100 banks from Argentina to study the effects of bank consolidation on bank performance between December 1995 and December 2000, a period of heavy bank consolidation and relative calm. We specify a bank return generating process that includes several macroeconomic and bank-specific risk factors. As an additional risk factor, we introduce a measure of bank consolidation. To ensure robustness, we also carry out the analysis using other performance measures including risk-adjusted returns and bank-insolvency risk. Overall, we find a positive and significant effect of bank consolidation on bank performance. Bank returns increase with consolidation, and insolvency risk is reduced. Additionally, the study suggests that mergers and privatizations have a significant beneficial effect on bank returns. While a merger increases a bank's return on equity and risk-adjusted return on equity by 4.53 percentage points and 0.30 points, respectively, a privatization increases it by 23.1 percentage points and 2.3 points, respectively. The effects of a bank acquisition on return on equity is, however, negative, reducing it by 2.62 percentage points. This might suggest that the healthy banks were encouraged to absorb weak and underperforming banks, an issue to be considered for further research. Acquisitions do not seem to have any significant effect on risk-adjusted return. The study also finds that a bank's insolvency risk is reduced significantly through mergers and privatization, with 0.22 point and 0.51 point reductions, respectively. Again, bank acquisitions seemed to have no impact on insolvency risk. We also find that among the macroeconomic risk factors, country risk is the most significant factor, while among the bank-specific risk factors, a bank's leverage and its measure of loan portfolio diversification are the most significant factors.

REFERENCES

Alston, Lee J. and Andres A Gallo, 2000, "Evolution and Revolution in the Argentine Banking System Under Convertibility: the Roles of Crises and Path Dependence," NBER Working Paper No. 8008 (Cambridge, Mass.: National Bureau of Economic Research).

Bank for International Settlements, 2001, "The Banking Industry in the Emerging Market Economies: Competition, Consolidation and Systemic Stability," BIS Papers No. 4, (August), (Basel: Monetary and Economics Department).

Benston, G, W. Hunter, and L. Wall, 1995, "Motivations for Bank Mergers and Acquisitions: Enhancing the Deposit Insurance Put Option versus Earnings Diversification," *Journal of Money, Credit and Banking*, Vol. 27, No. 3, pp. 777–88.

Berger, Allen N., Rebecca S. Demsetz, and Philip E. Strahan, 1999, "The Consolidation of Financial Services Industry: Causes, Consequences, and Implications for the Future," *Journal of Banking and Finance*, Vol. 23, pp. 135–94.

Berger, Allen N., 2000, "The Integration of the Financial Services Industry: Where are the Efficiencies?" FEDS Paper No. 2000-36, Available via the Internet: http://ssrn.com/abstract=239402.

Boyd, J, and S. Graham, 1998, "Consolidation in U.S. Banking: Implications for Efficiency and Risk," in *Bank Mergers and Acquisitions*, ed. by Y. Amihud and G. Miller, (New York: Kluwer Publishing)

Boyd, John H., and David E. Runkle, 1993, "Size and Performance of Banking Firms," *Journal of Monetary Economics,* Vol. 31, pp. 47–67.

Burdisso, Tamara, and Laura D'Amato, 1999, "Prudential Regulations, Restructuring and Competition: the Case of the Argentine Banking Industry." Working Paper No. 10, (October), (Buenos Aires, Argentina: Banco Central de la Republica Argentina).

Cebenoyan, A., and P. Strahan, 2001, "Risk Management, Capital Structure and Lending at Banks," (October) (Philadelphia: University of Pennsylvania, Financial Institution Center, The Wharton School).

Craig, B., and J. Santos, 1997, " The Risk Effects of Acquisitions," *Federal Reserve Bank of Cleveland Economic Review*, Vol. 33, pp. 25–35.

Dabos and Mera. 1998. "The Tequila Banking Crisis in Argentina," Universidad San Andres Working Paper, Available via the Internet: http://www.udesa.edu.ar/departamentos/economia/publicaciones/doctrabajo/doc19.pdf

Demsetz, Rebecca S., and Philip E. Strahan, 1997, "Diversification, Size and Risk at Bank Holding Companies," *Journal of Money, Credit, and Banking*, Vol. 29, No. 3 (August).

———, 1995, "Size, Diversification and Risk at Bank Holding Companies." Research Paper No. 9506 (New York: Federal Reserve Bank of New York).

———, 1995, "Historical Patterns and Recent Changes in the Relationship between Bank Holding Company Size and Risk," *Federal Reserve Bank of New York Economic Policy Review* (July).

De Nicoló, Gianni, 2000, "Size, Charter Value and Risk in Banking: An International Perspective," International Finance Discussion Papers, No. 689, (December), (New York: Board of Governors of the Federal Reserve System), pp. 1–42.

———, and others, 2003, "Bank Consolidation, Internationalization and Conglomeration: Trends and Implications for Financial Risk," IMF Working Paper 03/158, (Washington: International Monetary Fund).

Fernandez, Roque B, 1990, "What have Populists Learned from Hyperinflation?" CEMA Paper No. 71 (May).

Gelos, Gaston R., and Jorge Roldos, 2002, "Consolidation and Market Structure in Emerging Market Banking Systems," IMF Working Paper 02/186 (Washington: International Monetary Fund).

Gulde, Anne-Marie, David Hoelscher, Alain Ize, David Marston, and Gianni De Nicolo, 2004, *Financial Stability In Dollarized Economies*, IMF Occasional Paper No. 230 (Washington: International Monetary Fund).

International Monetary Fund, 2001, "Financial Sector Consolidation in Emerging Markets," Chapter V in *International Capital Market Report,* ed. by Donald J. Mathieson and Garry J. Schinasi (Washington: International Monetary Fund).

———, 2002, "Sovereign Debt Restructurings and the Domestic Economy: Experience in Four Recent Cases," SM/02/67.

———, 2004, *Financial Stability In Dollarized Economies*, IMF Occasional Paper No. 230.

Martinez Peria, Maria Soledad and Ashoka Mody, 2004, " How Foreign Participation and Market Concentration Impact Bond Spreads: Evidence from Latin America," *Journal of Money, Credit and Banking*, Vol. 36, No. 3 (Part 2), (June) pp. 511-542.

Rajan, Raghuram G, 1998, "The Past and Future of Commercial Banking Viewed through an Incomplete Contract Lens," *Journal of Money, Credit, and Banking,* Vol. 30 No. 3, (August) pp. 524-50.

Rajan, Raghuram G., 1996, "Why Banking Has a Future: Towards a New Theory of Banking," *Journal of Applied Corporate Finance* (July).

Data Definitions

Variables are classified under two risks categories: aggregate and specific. In the tables, variables preceded by Ch indicate that the variable is expressed in first difference to control for the unit root characteristic of the series. For example, Crisk defined country risk, and Ch_Crisk is country risk in first difference. In this appendix, the set of dependent variables ROE, Z-ROE and Z-ROA are defined as the mentioned performance variables.

Macro-risk factors

Country Risk (Crisk): In emerging markets, Crisk plays the main role because it is part of the underlying cost of capital. An increase in country risk could generate a fall in GDP, not only because of an adverse effect on investment's relative return, but because it could also lead to a potential restriction in accessing foreign credit lines. As a result, an increase in country risk would affect ROE, Z-ROE, and Z-ROA negatively, likely through increased credit and market risk.

Industrial Production (Emi): This is an industrial production index. It is a proxy to GDP growth, and it is expected that an increase in this index enhances performance.

Central Bank Reserves (M3res): This variable is the ratio between M3 and central bank international reserves. If the growth of bank liabilities is very rapid relative to both the size of the economy and the stock of international reserves, it maybe difficult to distinguish between good and bad credit; if bank assets differ significantly from liabilities in terms of liquidity, maturity, and currency denomination; if bank capital and loan loss provisions have not expanded to compensate for the volatility of the assets and asset quality, the banking system becomes more fragile. On that account, trend increases in M3 to reserves ratio reflect higher risk, particularly in the event of loss in confidence in currency, and can lead to a banking crisis. An increase in this ratio means that the banking system would have less resources to finance a bank run. We should expect that an increase in this variable reduces the efficiency variables.

Liquid Funds Available (Repo): This variable measures the ratio of liquid fund over total deposit. This credit line was granted to the central bank from the private sector. This variable not only shows the availability of liquid resource to the banking system, but also signals what private banks think about the health of the banking system. It is expected to have a positive effect because of the reduction of bank vulnerability to bank runs.

Factor 1: In order to reduce the number of aggregate macroeconomic risk factors we constructed Factor 1 using a factor model. (Any further explanation of the factor model/factor analysis is welcome).

Bank-specific risk factors

Loan Portfolio Diversification (Div1): This variable is estimated using the Herfindahl-Hirschman Index among type of loans categories: financial, nonfinancial public sector, and nonfinancial private sector. It is expected that a fall in the value of this variable (implying greater risk diversification) improves the bank's performance.

NonPerforming Loan (NPL): This variable measures the ratio between nonperforming loans over total loans. It is expected that a reduction of nonperforming loans improves the bank's performance.

Leverage (Lev): This variable is estimated as the ratio between a bank's liability and a bank's equity. A higher leverage indicates a higher risk in case the bank faces a run. It is expected that a higher leverage reduces Z-ROA (i.e., increases insolvency risk), increases ROE, but leaves Z-ROE unaffected in equilibrium, since leverage does not affect the Sharpe-ratio (or the risk adjusted return) in equilibrium.

Government Bonds Holdings (Govbond): This variable measures the bank's government bond holdings. From an accounting point of view, the holding of government bonds improves the performance because it does not take into account the real risk (zero risk weighting and, consequently, zero capital charge). On the other hand, we could expect a negative correlation with a bank's performance because a bank with a high percentage of its investment in government bonds risks bankruptcy if country risk increases significantly.

The following variables represent the ratio of specific types of loan over total loans:
Rsloan: Mortgage
Aloan: Overdraft loans (*adelantos*)
Dsfloan: Discount papers (do*cumento a sola firma*)
Ploan: Loans with real collateral
Perloan: Personal loans

The following variables are dummies to control some characteristics of banks
Dmerger: 1 once the merger takes place, 0 otherwise
Dacqui: 1 once the acquisition takes place, 0 otherwise
Dprivat: 1 once a public bank becomes a private bank, 0 otherwise
Ddisapp: 1 before the bank disappears, 0 otherwise

Z-ROA Definition

Let K represent the equity asset ratio and r represent return on assets. Then,

Prob($r \leq -K$) = $\int_{-\infty}^{-K} f(r)\, dr$.

Using Chebishev's inequality, we have

Prob ($r \leq -K$) $\leq \sigma^2 / (\mu + K)^2 = 1 / (\text{Z-ROA})^2$,

where Z-ROA = $(\mu + K)/\sigma$.

Note:
(i) Z- ROA: A higher value implies lower insolvency risk.

(ii) Z-ROA measures the number of standard deviations that returns have to fall in order to deplete equity.