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The Correlation of Nonperforming Loans between Large and Small Banks

Hugo Rodríguez Mendizábal

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Hugo Rodríguez Mendizábal†
Instituto de Análisis Económico (CSIC) and Barcelona GSE

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Abstract

This short paper presents a new stylized fact about bank nonperforming loans. According to the data for the US, the average of the ratio of noncurrent loans to total loans for large banks presents a very high negative correlation with the same ratio for small banks. This result remains valid for different measures of bank size as well as controlling for different bank characteristics such as charter class, specialization or geographical location.

Keywords: bank size, nonperforming loans
JEL classification codes: G21

1 Introduction

This short paper presents a new stylized fact about bank nonperforming loans. According to the data for the US, the average of the ratio of noncurrent loans to total loans (from now on NCL ratio) for large banks presents a very high negative correlation with the same ratio for small banks. This result remains valid for different measures of bank size as well as controlling for different bank characteristics such as charter class, specialization or geographical location.

There are a few papers analyzing how the size of a bank affects, at the bank level, the amount of nonperforming loans. Using data for Texas banks for the period 1980-1990, Clair [1] finds that larger banks tend to have higher nonperforming loan ratios. Although size is not a significant explanatory variable, Solttila and Vihriälä [4] find that, for Finnish banks in the 80s and 90s, loan growth is one of the major determinants of nonperforming assets later on. This result is in line with the conclusions of Salas and Saurina [3] for Spanish banks

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†Instituto de Análisis Económico. Campus UAB. 08193 Bellaterra Barcelona, Spain. E-mail: hugo.rodriguez@iae.csic.es.

although these authors in addition also find that bank size is negatively related with problem loans. The aim of the present paper is not to look at how size affects problematic loans but how the time series behavior of nonperforming loans in large banks correlates with that of small banks.

2 The Data

The data used in this paper is taken from the database *Statistics on Depository Institutions* provided by the Federal Deposit Insurance Corporation (FDIC) and available at www.fdic.gov. This data is obtained from the Federal Financial Institution Examination Council (FFIEC) Consolidated Report of Condition and Income (also known as *Call Reports*) and the Office of Thrift Supervision (OTS) Thrift Financial Reports submitted by all FDIC-insured depository institutions. The data set spans from the last quarter of 1992 until the first quarter of 2014 which represent 86 periods of data. The number of depository institutions included in the sample has been decreasing over time, due to mergers and exits, a trend well documented in the literature.[1] At the end of 1992 there were 13973 institutions reporting while at the beginning of 2014 this number has been reduced to 6739, less than half of the original size of the sample. The variables of interest for this study are Total assets/liabilities (asset), Total loans (idlnls), and Noncurrent loans and leases to total loans and leases (nclnlsr).[2] The FDIC defines Noncurrent loans as "the sum of loans and leases 90 days or more past due, and loans and leases in nonaccrual status".

I use Total assets/liabilities as a measure of bank size. In any case, results are unaltered if Total loans are used instead. As documented by Janicki and Prescott [2] the distribution of bank assets is highly skewed, with a large number of small banks and a few large banks. Because there is not a natural division between what a small or large bank is, I will show results for the top and bottom 5 percent of banks in the size distribution. I also include the same computations using different thresholds and the results remain the same.

Finally, I drop banks with ratios of loans to assets larger than 1 or smaller than 0 as I attribute these values to measurement errors. These corrections reduce the sample size by 28 observations or less per quarter which only represent below 0.3 percent of the actual sample size.

3 Empirical results

3.1 Whole sample

Figure 1 shows, for each quarter in the sample, the average NCL ratio for the whole distribution of banks (the grey solid line denoted as "average") as well as the median of the NCL ratio distribution (the grey dotted line denoted as

[1] See, among others, Janicki and Prescott [2].

[2] Acronyms from the original data set are in parenthesis.

"median"). As with the asset distribution, the figure demonstrates the skewness also present in the NCL ratio distribution: The median NCL ratio is systematically lower than the average NCL ratio. The figure also includes, for each quarter, the average NCL ratio for the 5 percent largest and 5 percent smallest banks (the series denoted as "large" and "small", respectively). Grey areas represent recessions as published by the NBER. The correlation between the average NCL ratios for small and large banks is very high, 0.88. However, we can see how NCL ratios are moving over time because the whole distribution is, itself, moving. To control for changes in the whole distribution, I subtract, for each observation, the average for the whole sample of the corresponding quarter. Figure 2 presents the averages of these differences for the 5 percent largest and 5 percent smallest banks. Now the two series have a strong negative correlation of -0.8349.

To check whether this result is due to the particular split between large and small banks, Panel a of Table 1 includes this correlation where small and large banks also represent, the bottom and top 1 percent, 10 percent, and 25 percent of the size distribution. The same pattern of strong negative correlation is also present in these cases. These results are not due either to the size of the sample. The column "Observations" shows the minimum (corresponding to the first quarter of 2014) and the maximum (corresponding to the last quarter of 1992) sample sizes. Thus, the average of the largest or smallest banks have been computed with either 1, 5, 10 or 25 percent of these sample sizes, which include hundreds of banks.

Table 1
Correlations of NCL ratios between small and large banks

	Observations	Largest and smallest banks			
	[min-max]	1%	5%	10%	25%
a. Differences with respect to population average					
Whole sample	[6689-13916]	-0.32	-0.83	-0.89	-0.98
(0-100)	[6207-13073]	-0.18	-0.81	-0.89	-0.98
b. Differences with respect to population median					
Whole sample	[6689-13916]	-0.10	-0.62	-0.70	-0.71
(0-100)	[6207-13073]	-0.05	-0.63	-0.69	-0.61
c. Differences with respect to populat. weighted average					
Whole sample	[6689-13916]	-0.73	-0.90	-0.91	-0.94
(0-100)	[6207-13073]	-0.73	-0.91	-0.90	-0.94

Data on the ratio of Noncurrent loans to Total loans include a relatively large number of "0s" and "100s". To check whether results are not due to data concentrating in extreme values, the row labelled "(0-100)" includes the results eliminating these observations. Notice the reduction in sample sizes. Again, results are maintained.

Above, I have mentioned the strong skewness of the distribution of banks both in terms of assets and in terms of NCL ratios. To control for this skewness Panel b of Table 1 repeats the same computations but taking differences with

respect to the median of the distribution of the NCL ratio instead of relative to the overall average. Results are in line with the ones in Panel a. Looking at Figure 1 this result is not surprising as the median behaves in a similar way as the average of the distribution of NCL ratios.

Finally, Panel c of Table 1 computes the same correlations but using differences with respect weighted averages of NCL ratios. These ratios are weighted by total loans of each bank. Still, large negative correlations are found.

3.2 Splitting the sample

The empirical findings described above could be due to a particular distribution of banks across different bank characteristics such as charter classes, product specializations or geographical location. To check whether similar results hold for these bank characteristics, the same computations are done for a variety of subsamples. Because the number of banks decreases rapidly as the sample is divided in categories, quarterly data is pooled annually and I will show the main results for the top and bottom 5, 10 and 25 percent of the size distribution of banks.

The dimensions in which I split the sample are:

- *Specialization.* The FDIC classifies depository institutions in 9 categories according to their primary specialization in terms of asset concentration. Results are presented in Table 2. The conclusions remain valid for the largest classes, namely, "Agricultural", "Commercial", "Mortgage" and "All other < $1 Billion" as well as some other smaller groups such as "International" and "All other > $1 Billion".

Table 2
Specialization

	Observations	Largest/smallest banks		
Specialization	[min-max]	5%	10%	25%
International	[21-45]	-0.55	-0.53	-0.88
Agricultural	[6072-11998]	-0.22	-0.50	-0.83
Credit-card	[65-225]	0.60	0.66	0.15
Commercial	[13762-13418]	-0.38	-0.82	-0.96
Mortgage	[2359-9032]	-0.39	-0.70	-0.95
Consumer	[197-1280]	0.24	0.30	0.49
Other spec. < $1 Bill.	[1542-4900]	0.07	0.05	-0.29
All other < $1 Billion	[3197-12570]	-0.71	-0.43	-0.60
All other > $1 Billion	[277-568]	-0.46	-0.43	-0.70

- *Charter class.* This is a classification code assigned by the FDIC based on the institution's charter type (commercial bank or savings institution), charter agent (state or federal), Federal Reserve membership status (Fed member, Fed nonmember) and its primary federal regulator (state chartered institutions are subject to both federal and state supervision). With this information, banks are classified in 6 categories:

1. N = commercial bank, national (federal) charter and Fed member, supervised by the Office of the Comptroller of the Currency (OCC).
2. NM = commercial bank, state charter and Fed nonmember, supervised by the FDIC or OCC.
3. OI = insured U.S. branch of a foreign chartered institution.
4. SA = FDIC supervised state chartered thrifts and OCC supervised federally chartered thrifts. Prior to that date, state or federally chartered savings associations supervised by the OTS.
5. SB = savings banks, state charter, supervised by the FDIC.
6. SM = commercial or savings bank, state charter and Fed member, supervised by the Federal Reserve.

   Table 3 presents the computations divided by charter-class. Results remain valid for 4 out of the 6 classes. Notice one of the two classes in which it does not hold (i.e. the class "OI") includes very few banks.

Table 3
Charter-class

	Observations	Largest/smallest banks		
Charter-class	[min-max]	5%	10%	25%
N	[4701-13550]	-0.66	-0.89	-0.95
NM	[15625-26987]	-0.86	-0.91	-0.98
OI	[36-158]	0.33	-0.03	-0.18
SA	[2213-7214]	0.11	-0.36	-0.74
SB	[1522-2266]	-0.57	-0.76	-0.91
SM	[3395-3861]	-0.76	-0.85	-0.97

- *Federal Reserve district*: The Federal Reserve District in which the institution is physically located. Table 4 shows the results. The correlation between NCL ratios of large and small banks remain negative in 9 out of the 12 district. Correlations are positive for 3 of the 4 smallest districts in terms of number of banks.

Table 4
Federal Reserve district

	Observations	Largest/smallest banks		
Fed district	[min-max]	5%	10%	25%
Atlanta	[3318-6364]	-0.76	-0.79	-0.95
Boston	[1022-2134]	0.03	-0.16	-0.61
Chicago	[2242-9160]	-0.71	-0.94	-0.99
Cleveland	[1494-2946]	-0.60	-0.89	-0.90
Dallas	[2475-4903]	-0.76	-0.92	-0.94
Kansas City	[3991-7893]	-0.84	-0.89	-0.98
Minneapolis	[2707-4630]	-0.54	-0.82	-0.96
New York	[999-2063]	-0.13	0.26	-0.27
Philadelphia	[835-1635]	0.17	-0.54	-0.48
Richmond	[1550-3410]	0.06	-0.59	-0.88
San Francisco	[1815-3581]	-0.16	-0.50	-0.89
St. Louis	[2760-5317]	-0.84	-0.76	-0.92

4 Conclusions

This paper has presented evidence about the negative correlation between nonperforming loan ratios of large and small banks. This result has several implications for the banking industry in the US. First, it shows how an aggregate worsening of loan quality can be distributed differently depending on the size of a bank. Second, because the supply of credit differs between large and small banks, the different evolution of the quality of their loans may affect aggregate loan supply. This composition effect may remain hidden if one only looks at the relation between the aggregate Nonperforming loan ratio and the aggregate loan level. Third, because loan quality is an indicator of future banking profitability, this result suggests that profitability may diverge across banks according to their size.

References

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Figure 1: Ratio of Noncurrent loans to total loans

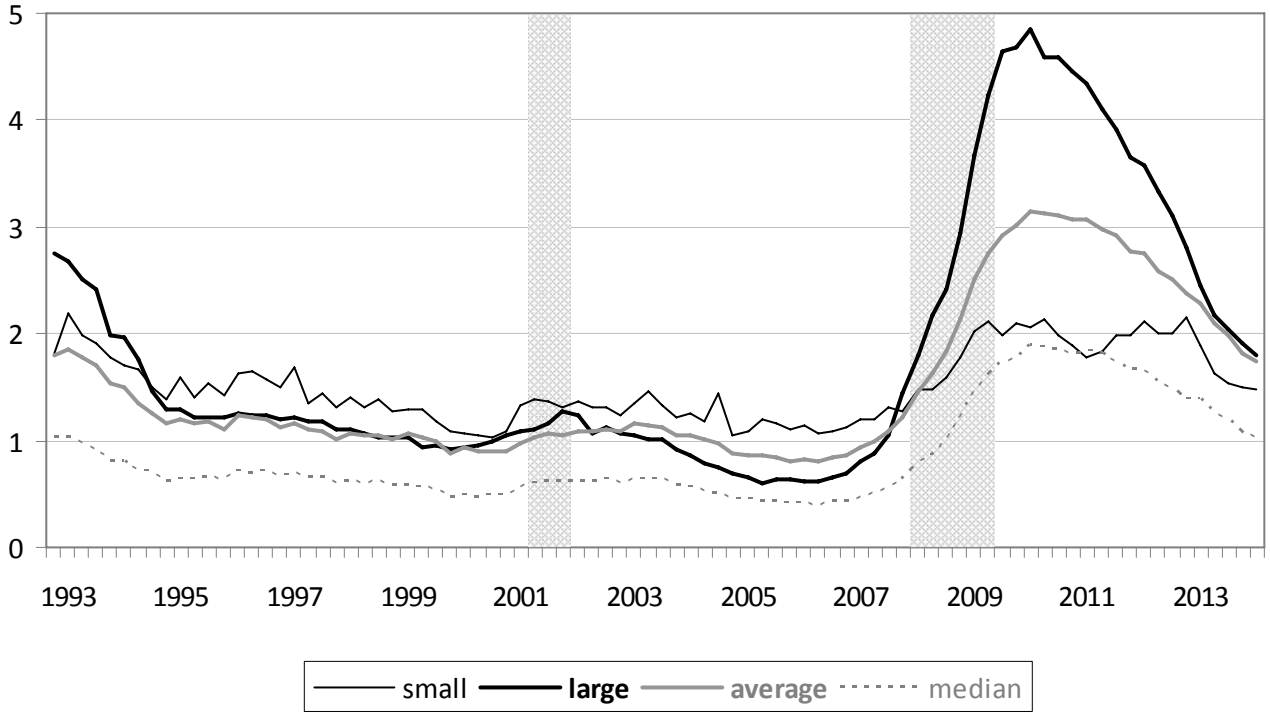

Figure 2: Differences of Noncurrent loan ratio with respect to population average