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Bank capital and lending: An analysis of commercial banks in the United States

Sudipto Karmakar [a,*,1], Junghwan Mok [b,2,3]

[a] Banco de Portugal, Avenida Almirante Reis 71, 1150-012 Lisbon, Portugal

[b] Macroprudential Research Team, Macroprudential Analysis Department, Bank of Korea, 39 Namdaemunno, Jung-Gu, Seoul, South Korea

HIGHLIGHTS

- We study the relationship between capital ratios and business lending.
- Propose a new identification strategy to deal with common endogeneity problems.
- We find a moderately positive and significant relationship.
- Bigger banks show a stronger relationship than the smaller banks.
- Low capitalized banks show a stronger relationship than the well capitalized banks.

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ABSTRACT

We evaluate the relationship between capital ratios and business lending of commercial banks in the United States. Using two different measures of capital, we find a moderate relationship between capital ratios and business lending. We also propose an innovative instrumenting technique to overcome common endogeneity problems.

1. Introduction

The effect of changes in bank capital ratios on lending decisions is one of the primary determinants of the linkage between financial conditions and real activity. During the financial crisis, when the likelihood of a credit crunch was still under debate, the relationship between bank capital and lending was a key policy concern. Likewise, when the Troubled Asset Relief Program moved to inject capital into banks through the Capital Purchase Program, the impact of the program on real activity largely focused on the effect of these injections on bank lending.

In the aftermath of the 1990–1991 recession many observers debated whether the Basel I capital regulations were hindering lending. Although this debate did not yield a consensus, it did result in the development of empirical models that sought to quantify the effect of bank capital on bank lending. For example, Hancock and Wilcox (1993, 1994), Berger and Udell (2004), and Bernanke and Lown (1991) are some of the earlier papers.

Our study is different in that we focus specifically on business lending. We feel that lending to non-financial corporations is an important engine of growth. Our contribution is twofold. First, we quantify the relationship between bank capital ratios and business lending. Second, we contribute methodologically by proposing an innovative instrumenting technique that helps us address the problems related with the simultaneous determination of capital and lending.

2. Data and stylized facts

We use an unbalanced panel of commercial banks. Our data covers 60 quarters from 1996:Q1 to 2010:Q4 and are obtained from the call reports database of the Chicago Fed.

* Corresponding author. Tel.: +351 213 128 108.
E-mail addresses: skarmakar@bportugal.pt (S. Karmakar), jhmok@bok.or.kr (J. Mok).

[1] The views expressed are of the author and do not represent the views of the Banco de Portugal or the Eurosystem.

[2] The views expressed are of the author and do not represent the views of the Bank of Korea.

[3] Tel.: +82 2 750 6858.

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Table 1
Summary statistics.

Variable	All Mean	All Median	All SD	Big Mean	Big Median	Big SD	Small Mean	Small Median	Small SD
CAR	0.1540	0.1357	0.0629	0.1495	0.1326	0.0587	0.1704	0.1492	0.0737
Tier 1 Cap	0.0944	0.0877	0.0285	0.0925	0.0865	0.0268	0.1015	0.0933	0.0329
LTAR	0.4728	0.4787	0.1691	0.4905	0.4978	0.1641	0.4087	0.4013	0.1712
LTANR	0.1890	0.1692	0.1197	0.1786	0.1589	0.1166	0.2266	0.2101	0.1231
%Δ HPI	0.0074	0.0092	0.0169	0.0074	0.0092	0.0174	0.0071	0.0091	0.0148
Liquidity	4.1156	4.1896	1.8572	4.6479	4.7361	1.8235	3.5333	3.6109	1.7135
Chargeoffs	1.2476	1.2008	0.1941	1.2368	1.1939	0.1813	1.2582	1.2094	0.2055
%Δ GDP	0.0064	0.0067952	0.0070901						

We have 343,752 observations on commercial banks in the US. We drop the top and bottom deciles by average total assets. The land price change acts as an exogenous shock in our model. The bigger banks in the US are sufficiently diversified and do not respond to local land price changes. The smallest banks mainly dropped out as part of our outlier treatment as they show unusually high capital ratios. We think that only the medium sized banks are likely to be more sensitive to local land price movements. We only include banks that have a capital adequacy ratio less than or equal to 25%. We also drop observations if the loan growth rate exceeds 50% in a particular quarter. We then divide the remaining 80% banks at the median and call them 'big' and 'small' for the remainder of the paper (see Table 1).

We study two different measures of capital ratios, namely the Capital Adequacy Ratio (CAR) and the Tier 1 Ratio (Tier 1 Cap). CAR is total capital (Tier 1 + Tier 2) as a fraction of risk weighted assets. The Tier 1 Cap is the Tier 1 capital normalized by risk weighted assets. LTANR and LTAR are the shares of business and real estate lending in total assets, respectively. The growth in the house price index is %Δ HPI. The liquidity is the share of securities in total assets. Chargeoffs represent loan charge-offs as a percentage of total loans. We use the GDP growth rate (%Δ GDP) as a control for the demand side effects.

3. The empirical framework

The empirical model we estimate is the following:

$$LTANR^{s}_{i,t} = \beta K_{i,t} + \gamma_1 BSC_{i,t-1} + \gamma_2 GDP_{t-1} + \nu_s + u_{i,t}, \quad (1)$$

where $LTANR^{s}_{i,t}$ is the business loan to asset ratio of bank i at time t, with headquarters located in state s. $K_{i,t}$ is a measure of the capital ratio. $BSC_{i,t-1}$ consists of lagged bank specific controls which include liquidity and loan charge-offs. GDP_{t-1} is the growth rate of real GDP to help us account for demand side factors. ν_s represents state fixed effects to capture within state changes.

3.1. Endogeneity issues and IV estimation

Eq. (1) above assumes that the bank sequentially decides first on capital holdings and then on lending. In practice, such decisions are not sequential but simultaneous. Hence, we find a suitable instrument to identify bank capital. Our instrument is the bank's exposure to the real estate sector times the change in house prices. Our first stage regression is the following:

$$K_{i,t} = \alpha + \theta\, \overline{LTAR}^{s}_{i,t-1} * \%\Delta\, HPI_t + BSC_{i,t-1} + GDP_{t-1} + \nu_s + \nu_{i,t}, \quad (2)$$

where $\overline{LTAR}$ is the average share of real estate lending in the last three quarters. It measures the exposure of a bank to this particular sector. The greater the exposure, the greater will be the sensitivity of the bank's capital to land price movements. $\%\Delta\, HPI$ is the percentage change in the land price index. We also include bank specific and macro controls and state fixed effects.

Table 2
First stage regression.

Variables	(1) CAR All	(2) T1 Cap All
$\overline{LTAR}_t * \%\Delta\, HPI_t$	6.040*	3.310*
	(1.478)	(1.083)
Chargeoffs_{t-1}	8.819*	0.360**
	(0.398)	(0.186)
Liquidity_{t-1}	−0.059*	−0.124*
	(0.008)	(0.006)
GDP growth_{t-1}	14.775*	5.428*
	(1.075)	(0.662)
Constant	6.400*	10.648*
	(0.497)	(0.233)
Observations	126,467	126,467
Number of banks	6820	6820

Notes: Robust standard errors are reported in the parentheses. State level fixed effects were included in both (1) and (2).
* $p < 0.01$.
** $p < 0.05$.

The impact of land price changes on bank capital depends on the bank's exposure to this sector. If a bank has sufficient exposure to the real estate market, a rise in land prices will raise the value of its assets and in turn equity, liabilities roughly remaining unchanged. On the other hand, if the bank has limited exposure to the real estate sector, this appreciation in land prices will have a much more subdued impact on its capital. The Generalized Method of Moments technique has also been used to deal with endogeneity issues. Gambacorta and Mistrulli (2004) use this methodology to analyze the bank lending channel in Italy. Our methodology should be viewed as complementary to this approach.

4. Regression analysis

We briefly comment on the first stage regression which is the direct estimation of Eq. (2). The results are shown in Table 2. Columns (1) and (2) predict the CAR and the Tier 1 capital ratio respectively. The sign on the instrument is positive and significant at the 1% level.

Table 3 shows the results of our main IV estimation. Columns (1) and (2) show results from our entire sample. Columns (3) and (4) report results for big banks while columns (5) and (6) report results for small banks.

The coefficient on the capital ratio remains positive and significant at the 1% confidence level, mostly. Our magnitudes are much smaller than those suggested by Adrian and Shin (2010) but are in agreement with other papers that use US data and in which the sample period starts after the introduction of the Basel Banking Accord in 1989 (Berropside and Edge, 2010).[4] Also, the effect of capital ratios on business lending is greater for the bigger banks. Bigger

[4] Adrian and Shin (2010) analyze total lending but we focus specifically on business lending.