Bank capital regulation and bank lending in South Africa

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Abstract

Keywords:
JEL numbers:

I Introduction

II Background and research questions

III Developments in South African Banking: 2000 - 2020

IV Specification

Assets	**Assets**	**Liabs**	**Liabs**
Loan type 1	L_1	D	Deposits
Loan type 2	L_2	F	Funding
Securities	S	C	Equity

Table I: Bank balance sheet

Banks are indexed by $b \in (1, 2 \ldots B = 5)$ Loan types are indexed by $j \in (1, 2 \ldots J = 6)$ Monthly data indexed by $t \in (1, 2 \ldots T)$

Demand for lending (aggregated across banks) depends on bank loan rates and other macroeconomic variables.

$$L^d_{jt} = D_j(r_j t, \boldsymbol{z}_t)$$

The supply of lending, by bank b is assumed to seperable in bank specific structural supply and inthe bank's cost of capital $\rho_{b,t-i}$ and the resulting mark up on market rates (r_t:

$$L^s_{bjt} = S_j(\rho_{b,t})L^s_b$$

The risk weighted capital ratio of bank b is $c_{b,t}$ and the required minimum capital ratio by $c\tilde{c}_{b,t}$ and suppose has a target level for capitalisation (a target capital level) of $c^*_{b,t} = \tilde{c}_{b,t} + \bar{c}_b$ ($\bar{c}_b$ is a bank specific target capital buffer).

The (unobserved) cost of capital of bank b depends a fixed bank specific risk-appetite, on market rates of interest, its target level of capital and on any shortfall of capital relative to target:

$$\rho_{b,t} = \phi_{0,b} + \phi_{1,b} c^*_{b,t} + \phi_{2,b}(c^*_{b,t} - c_{b,t}) + \phi_{2,b}(c^*_{b,t} - c_{b,t})^2$$

The quadratic term allows for the possibility of the cost of capital increasing non-linearly with the shortfall of capita.

We expect the log of bank lending l_{bjt} of loan type j by bank b to depend on macro- and demand - variables z_t, on a fixed bank parameter θ_b and on the time varying cost of capital for bank b:

$$l_{bjt} = \theta_b + \varphi_j z_t - \theta_j \rho_{b,t} + \epsilon_{bjt}$$

Following Fanget al. (2022), Aiyar et al (2014, 2016)) we are seeking to quanity the change in the growth of bank lending , in the months following changes in capital and in capital requirements. We therefore estimate this equatoin in first differences, including lags, of the components of the cost of capital.

These first differenced components are :

$$\begin{aligned}
\Delta\phi_{0,b} &= 0 \\
\Delta c^*_{b,t} &= \Delta\tilde{c}_{b,t} + \Delta\bar{c}_b = \Delta\tilde{c}_{b,t} \\
\Delta(c^*_{b,t} - c_{b,t}) &= \Delta\tilde{c}_{b,t} + \Delta\bar{c}_b - \Delta c_{b,t} \\
\Delta(c^*_{b,t} - c_{b,t})^2 &= \Delta(\tilde{c}_{b,t} + \bar{c}_b - c_{b,t})^2 \\
&= \Delta(\tilde{c}_{b,t} - c_{b,t})^2 + \Delta\bar{c}_b^2 + 2\Delta\left(\bar{c}_b(\tilde{c}_{b,t} - c_{b,t})\right)
\end{aligned}$$

If we further assume that the target risk weighted capital ratio is the same for all bank i.e. $\bar{c}_b = \bar{c}$, then the final element becomes;

$$\Delta(c^*_{b,t} - c_{b,t})^2 = \Delta(\tilde{c}_{b,t} - c_{b,t})^2 + 2\bar{c}\Delta(\tilde{c}_{b,t} - c_{b,t})$$

This suggests the following estimation strategy.

1. Estimate the following linear reduced form equations, seperately for each of the six loan categories $j = 1, 2 \dots 6$ (j subscripts supressed)

$$\begin{aligned}
\Delta l_{b,t} = \alpha_b + \sum_{i=0}^{3} \Delta\alpha_{1,i}\tilde{c}_{b,t-i} + \sum_{i=1}^{3} \Delta\alpha_{2,i}\Delta(c_{b,t-i} - \tilde{c}_{b,t-i}) \\
+ \sum_{i=1}^{3} \Delta\alpha_{3,i}\Delta(c_{b,t-i} - \tilde{c}_{b,t-i})^2 + \sum_{i=0}^{3} \alpha_{4,i}\Delta r_b + \alpha_5 \boldsymbol{z}_t
\end{aligned}$$

2. Explore the p;ossibliyt of increasing the power of the estimation, buy estimating the six equatgions together with the following non-linear parameter restriction, based on the assumption of the same supply response to changes in the cost of capital for each loan category i in the different banks b

$$\begin{aligned}
\Delta l_{j,b,t} = \alpha_{bj} + \gamma_b \Bigg(\sum_{i=0}^{3} \Delta\alpha_{1,i}\tilde{c}_{b,t-i} + \sum_{i=1}^{3} \Delta\alpha_{2,i}\Delta(c_{b,t-i} - \tilde{c}_{b,t-i}) \\
+ \sum_{i=1}^{3} \Delta\alpha_{3,i}\Delta(c_{b,t-i} - \tilde{c}_{b,t-i})^2 \Bigg) + \delta_b \left(\sum_{i=0}^{3} \alpha_{4,i}\Delta r_{b,t-i} + \alpha_{5,b}\boldsymbol{z}_t \right)
\end{aligned}$$

3. Whether we prefer the linear or non-linear specification, we can then go on to investigate more fully the identification (to capture the impact of bank capial on the interest ratge margin as well as the direct impact on lending), estimating margin equations, either the following linear specification

$$\Delta r_{b,t} = \beta_b + \sum_{i=0}^{3} \Delta\beta_{1,i}\tilde{c}_{b,t-i} + \sum_{i=1}^{3} \Delta\beta_{2,i}\Delta(c_{b,t-i} - \tilde{c}_{b,t-i}) + \sum_{i=1}^{3} \Delta\beta_{3,i}\Delta(c_{b,t-i} - \tilde{c}_{b,t-i})^2 + \sum_{i=0}^{3} \beta_{4,i}\Delta r_t + \beta_5 \boldsymbol{z}_t$$

or one with non-linear restrictions imposed (cross bank restrictions as before and also potentially $\sum_{i=0}^{3} \beta_{4,i} = 1$)

V Results and robustness tests

VI Conclusions

Appendix Literature review