Bank Recapitalisation and Credit Growth: The Indian Case

Verma, Radheshyam and Herwadkar, Snehal

Reserve Bank of India

4 December 2019

Bank Recapitalisation and Credit Growth: The Indian Case

Radheshyam Verma and Snehal S. Herwadkar[1]

The continuing deterioration in asset quality of public sector banks in India since 2012 has had multidimensional ramifications. On the one hand, while significant loan loss provisions were required to be kept, eroding the profitability of these banks, on the other hand, it affected their risk-taking ability and resources available for on-lending to commercial sector. From a macroeconomic perspective thus, poor asset quality and lower economic growth reinforced each other into a vicious cycle. The government intermittently infused capital in the public-sector banks, but most of that was absorbed by the continuing deterioration in asset quality, delaying the revival in the credit growth cycle. This led to the question of how much capital infusion is necessary to kick-start the credit cycle. Using bank-wise data for the period 2008-18, the present study analyses this question in a dynamic panel framework. The findings of the study suggest that the relationship between bank capital and credit growth is non-linear. Any amount of recapitalisation in banks is may be helpful in accelerating credit growth. However, the study found the single threshold level 13.1 per cent of CRAR level would be optimal. Above this threshold level, incremental increase in bank capital has positive but declining marginal effects on lending

JEL Classification: G21, G28.

Keywords: Bank capital, regulatory capital, recapitalisation, bank lending**.**

Motivation

The progressive deterioration in asset quality of Indian public-sector banks (PSBs) since 2012 has led to considerable increase in loan loss provisioning requirements, affecting their profitability adversely and also to an erosion of their capital base. Simultaneously the credit growth has remained anaemic till 2018 before the recent revival. This led to the hypothesis among analysts that the capital shortfall of the banks is one of the major factors constraining their credit growth. The intermittent doses of capital infusion by the Government were just sufficient (or in some cases less than sufficient) for banks to meet the minimum capital requirements and keep their head above the water. In fact, during last three years, the seventy percent of the capital infusion in PSBs was eroded by their growing losses. In this scenario, it is pertinent to

[1] Authors are Assistant Adviser and Director respectively in Department of Economic and Policy Research, Reserve Bank of India. The views expressed in this article are that of the authors and not of the RBI. Corresponding author: Radheshyam Verma (rsverma@rbi.org.in). We thank an anonymous referee from the Reserve Bank for insightful comments. An earlier version of the paper was presented at Symposium on Money, Banking and Finance (February 22-23, 2019) at Pondicherry University. The authors are thankful to the participants of the conference.

ask whether the piecemeal approach in bank recapitalisation is helpful in reviving credit growth or does it just amount to wastage of exchequer money?

Against this background, the present paper analyses the relationship between bank recapitalisation and credit growth in a panel Generalised Method of Moments (GMM) framework. The results suggest that the relationship is nonlinear in nature; till a certain threshold level of capital infusion, the deceleration in credit growth remained unabated. Beyond a certain threshold however capital infusion was instrumental in kick-starting the credit growth.

Although the interrelationship between capital infusion and credit growth has been studied in the context of advanced economies, such studies are scarce in the Indian context and the present paper makes an important contribution in this regard. The findings of the paper are likely to be important from policy perspective as it crystallises the relationship between recapitalisation and bank lending and brings more clarity to aid the decision-making process.

Stylised Facts

The world over, the need for recapitalisation of banks is often triggered by macroeconomic or banking crises which erode the capital base of the banks. Major examples of this include the capital infusion in Japanese banks in the 1990s and more recently recapitalisation in Swiss, UK and US banks after the global financial crisis (GFC). Another, although less frequent, trigger is recalibration of regulatory requirements that necessitate higher capital[2]. The mechanisms of recapitalisation have also differed; although raising more capital through the markets is a preferable option, in majority of the cases it is not feasible and the burden of recapitalisation has been largely borne by central banks or the government[3].

In the Indian context, recapitalisation of banks is a recurrent buzzword although the issue and challenges faced are somewhat unique, due to the dominance of public sector banks with majority shareholding of the government and resistance to dilute the

[2] For example, BIS has been regularly calculating the capital shortfall in banks due to implementation of Basel III norms. E.g. https://www.bis.org/publ/bcbs278.pdf, https://www.bis.org/bcbs/publ/d449.pdf etc.

[3] For example creation of StabFund under Swiss National Bank was financed by Swiss Government while the Capital Purchase Programme under the Troubled Assets Relief Programme (Paulson plan) was implemented by the US Treasury.

shareholding of government[4]. It is for this purpose that the Union Budgets have regularly earmarked funds for recapitalisation of banks, apart from providing recapitalisations as a part of fiscal stimulus[5].

Two factors, intertwined together, have contributed to an increase in the necessary quantum and sense of urgency for bank recapitalisation in the recent period. First, the phased transition to Basel III norms which required higher and better quality capital to be maintained by the banks and second, the deterioration in asset quality, which necessitated larger provisions and higher capital requirements.

The Basel III capital regulation has been implemented from April 1, 2013 in India in phases and it is expected to be fully implemented by March 31, 2019. The estimates on capital shortfall due to implementation of these regulations have differed. For example, the initial estimates of the Reserve Bank projected an additional capital requirement of Rs. 5 trillion, consisting of non-equity capital of the order of Rs. 3.25 trillion while equity capital of nearly Rs. 1.75 trillion (Subbarao, 2012)[6]. The two important assumptions on which the estimates were based include: risk weighted assets of individual banks were expected to increase by 20 per cent per annum and banks were expected to fund 1 per cent capital requirements through retained earnings These assumptions, however, did not materialise in the subsequent years as the non-performing assets (NPAs) of banks, especially that of public sector banks increased sharply from 3.3 per cent in end-March 2012 to 14.6 per cent in March-2018 requiring banks to earmark greater provisions, which in turn adversely affected their profitability.

In the wake of these developments, the Indradhanush plan announced by the Government in August 2015 envisaged to provide Rs. 700 billion over 2015-16 to 2018-19 to PSBs so as to better capitalise them and support credit growth. Further, recapitalisation of PSBs with Rs. 2.1 trillion announced in October 2017 is planned

[4] The shareholding of government and RBI together ranged between 58 per cent (State Bank of India) and 93 per cent (United Bank of India) in nationalized banks as at end-March 2018.
[5] An example of budgetary provision for recapitalization of nationalized banks is Union Budget of 1993-94 which earmarked Rs. 5,700 crore to help the banks meet the first stage implementation of Basel I norms. An example of fiscal stimulus is the government infusion of nearly Rs. 3,100 crore in the aftermath of global financial crisis as tier I capital in a few PSBs.
[6] Other agencies placed the capital infusion requirement at a higher level e.g. around the same time international credit ratings agency Fitch estimated this figure to be at around USD 50 billion, while ICRA projected a figure of around USD 80 billion.

over 2017-18 and 2018-19[7]. Out of Rs. 2.1 trillion, Rs. 1.53 billion will be through infusion of capital by the Government and the balance is envisaged through capital raising by banks themselves from markets and unlock value from their non-core assets. Government has provided Rs. 881 billion for 2017-18. Capital infusion to the tune of Rs. 650 billion was initially planned for 2018-19 which was raised to Rs. 1,060 billion on December 20, 2018 by the Government aimed at meeting regulatory capital norms and strengthening amalgamating banks by providing regulatory and growth capital (Chart 1).

In the last three years (between 2015-16 and 2017-18) on average more than 70 per cent of the infused capital in the PSBs was eaten up by losses incurred by them (Chart 2). This left the PSBs with little capital to build up their capital base.

Chart 1: Asset Quality, Capital Adequacy and Capital Infusion in PSBs

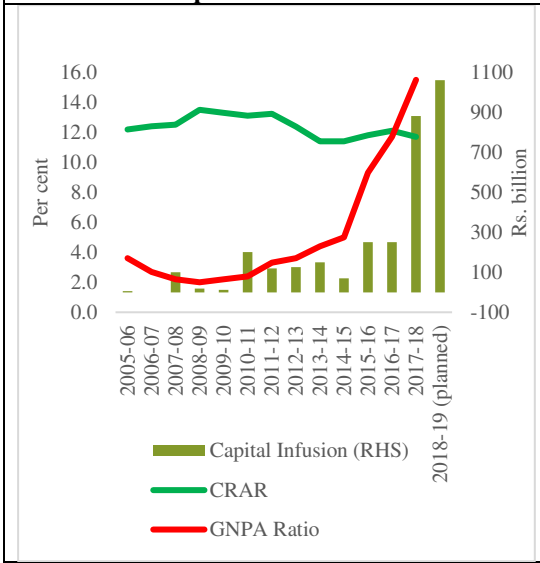
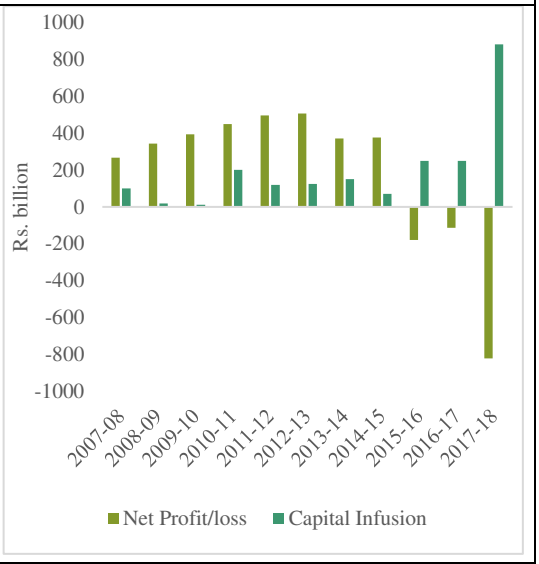


Chart 2: Capital Infusion and Net Profits



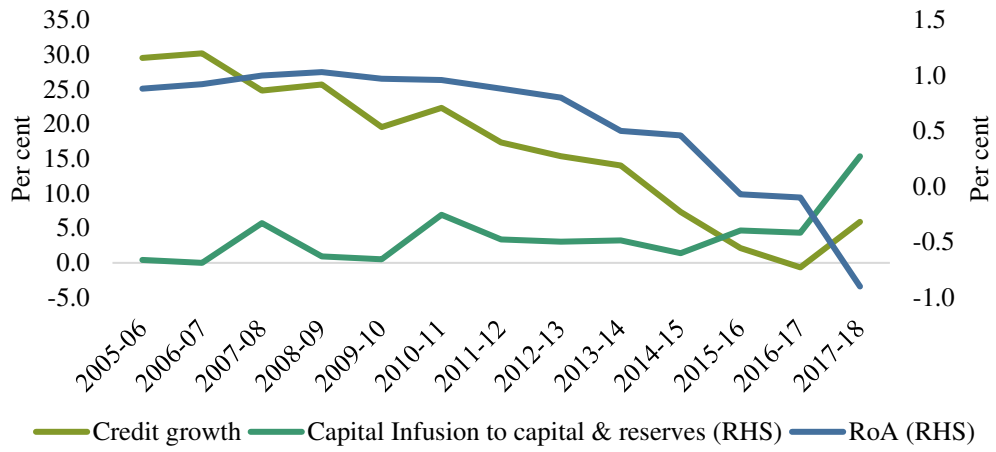
Source: Report on Trend and Progress of Banking in India and Statistical Tables Relating to Banks in India, RBI.

During the same period, the credit growth has been tepid and decelerated continuously to reach nadir of de-growth in 2016-17. This led suggestions in the media as well as among analysts that the delicate capital conditions of the banks, especially PSBs, adversely affected their ability to lend resources to the commercial sector. It is noteworthy that the credit growth has remained tepid notwithstanding intermittent bouts of capital infusion, leading to the hypothesis that only if the recapitalisation

[7] Includes Rs. 81.4 billion of the residual amount under Indradhanush envisaged for FY 2017-18.

amount is large enough relative to their total capital base, it can make some perceptible impact on credit growth (Chart 3).

Chart 3: Capital Infusion, Profitability and Credit Growth



Source: Statistical Tables Relating to Banks in India, RBI.

A careful empirical analysis is however required for establishing the hypothesis. This is because this period was also characterised by intermittent bouts of growth slowdown leading to the question whether the credit slowdown was a supply side or demand side phenomenon. In other words, we need to make amends for the slowdown in growth and resultant slowdown in credit demand to understand whether credit slowdown was due to insufficient bank recapitalisation.

Literature Review

There exists a vast empirical literature which examines the two channels through which weak capital base of the bank may impact its lending activity: one, the bank may try to conserve its capital and any capital in excess of minimum regulatory requirement may be either used to finance retail loans, which typically have lower NPAs or may be invested, possibly in government bonds. As such productive sectors of the economy may remain credit starved. Second, weakly capitalised banks are perceived as riskier by depositors and investors, which increases its cost of funding through bonds and unsecured deposits, which in turn affects their lending activity adversely. In the post GFC period, the second channel is found to be pervasive; a 1 percentage point increase in the equity-to-assets ratio is associated with 4 bps reduction in the cost of debt financing of banks. This reduction in cost, in turn, translates into greater lending: one percentage point increase in the equity to assets

ratio is shown to increase annual credit growth by 0.6 percentage point (Gambacorta and Shim, 2016).

A more serious outcome of the undercapitalised banks is their increased incentive for evergreening of loans. A chronically undercapitalized bank—especially in the absence of enough supervisory vigil—has an incentive to rollover loans of financially weak existing borrowers. These borrowers, in turn, are able to use these funds for repayment of their immediate obligations thus keeping their head above the water, while the banks can avoid classifying these loans as NPAs. This way the bank avoids making additional provisions and further erosion in their capital base. A fallout of this is that the loan supply is shifted away from more creditworthy firms to less credit worthy firms (Acharya, 2017).

The economic literature is unanimous in stressing that in order to avoid such outcomes it is necessary that the banks should be adequately capitalised. A related question is about the 'optimal' amount of recapitalisation to ensure that the credit flow to the economy is not constrained. In practice fiscal constraints of the government, uncertainty whether financial markets may adequately pick-up the tab and moral hazard concerns of the central bank may translate into lesser dosses of recapitalisation of the bank than what is required.

Previous literature in this regard suggests that banks can turn additional capital into greater lending only once their capitalisation exceeds a critical threshold as undercapitalised banks try to restore their regulatory capital ratio without generating new lending (Brei *et al*, 2013). Their findings thus suggest that recapitalisations beyond a certain threshold, is able to sustain credit by helping banks to survive extreme distress, and by moving their capital ratios into a territory that allows banks to expand their lending again.

In the case of Japanese banks too, Giannetti and Simonov (2013) found that if capital injections were large enough to reestablish bank capital requirements, it increases the supply of credit and spurs investment. Capital injections that are too small, fail to increase the supply of credit, but they also encourage the ever-greening of nonperforming loans. Berrospide and Edge (2010), on the other hand in the context of United States found that capital ratios associated with both the Troubled Asset Relief Program (TARP) related capital injections in 2008 and subsequent efforts to raise

capital privately by banks during 2009 made only a small positive contribution to bank loan growth and were more than offset by adverse factors such as reduced loan demand, increased risk, and somewhat tighter lending standards.

The present paper takes this strand of literature ahead by asking whether small doses of recapitalisation in India are useful in reviving bank credit growth.

Data and Methodology

The basic model that we estimate using a panel of 21 PSBs is as follows:

$$Loan\_growth_t = Loan\_growth_{it-n} + Capital\_infusion_{it-n} + Capital\_infusion^2_{it-n} + Bank\_variables_{it-n} + Macroeconomic\_variables_{t-n} + Dummy\_AQR_t$$

The primary focus of the paper is evaluating the interrelationship between capital infusion and credit growth. In the model specification. apart from bank capital infusion, the paper also introduces square of capital infusion as an explanatory variable to capture the possible non-linearity in their relationship following Brei et al (2012). In other words, the quadratic specification of the capital infusion term is designed to capture the non-linearity in the relationship. Apart from the capital base of the banks, their lending is typically determined by a combination of bank specific and macroeconomic factors which are accounted for in our framework by introduction of several control variables. The bank specific control variables include tier I capital ratio, capital to risk weighted assets ratio (CRAR), net interest income (NIM), return on assets (RoA), gross non-performing assets (GNPAs) ratio, total stressed assets (GNPAs + restructured standard advances)[8] as per cent of gross advances and weighted average lending rate (WALR), while the nominal GDP growth is used as a macroeconomic control variables. Using alternate combinations of these control variables, a variety of models were tested. One of the limitations of testing how bank specific and macroeconomic variables impact bank lending is that the financial conditions of banks could, in turn impact the macroeconomic conditions and monetary

[8] Till the Reserve Bank undertook the Asset Quality Review (AQR) (elaborated subsequently) in 2015, evergreening of assets was rampant and the GNPA ratio did not paint a realistic picture of the banking stress. In order to overcome this issue, restructured advances are added to the GNPA to get a more realistic stressed asset ratio.

policy cycles. In order to take care of such endogeneity, we use the Arellano-Bond dynamic panel model, which uses GMM method and yields consistent and unbiased estimates of relationship. Lags of liquid assets to total assets, deposit to loan ratio, NIM were used as instrumental variables.

The introduction of asset quality review by the Reserve Bank in 2015-16, aimed at making banks recognise their asset quality realistically, was a watershed moment in the Indian banking history. Data available on bank lending till the initiation of AQR consisted of two components: amount extended for evergreening of loans and new loans. It is difficult to segregate the loans data in these two components. In order to take care of this, a dummy on AQR is introduced in the model. The dummy takes a value of zero before 2015-16 and one otherwise. A variety of specifications where the AQR dummy is interacted with other variables are also tested.

To ensure that coefficients in the model are efficient and consistent, it was tested for serial correlation and was found that models were not subject to serial correlation of order two. It was also found that instruments were valid as Sargan tests for over-identifying restrictions were not found significant.

Annual data for a panel of 21 PSBs for the period 2008-09 to 2017-18 was chosen for the study, constrained by the fact that bank-wise capital infusion by the Government is available only from this period onwards from Ministry of Finance (2017). Other bank specific variables were taken from *Statistical Tables Relating to Banks in India* and macro-economic variables were taken from *Database on Indian Economy*, Reserve Bank of India.

Empirical Model and Results

Regression results suggests that capital infusion in levels was not significant in influencing loan growth of PSBs. However, the square of the recapitalisations had an impact on loan growth of banks with two period lags. Thus, the relationship between bank lending and recapitalisation is non-linear. It suggests that small doses of recapitalisations of PSBs are not effective enough to lead to higher lending by banks as in the environment of high NPAs they are just able to meet their minimum capital requirement. Only if the capital infusion is higher than certain threshold that it can lead to higher credit growth. The finding is in line with Brei et al (2013), who found

that only banks at higher levels of capitalisation can effectively translate additional capital into increased lending.

Table 1: Arellano-Bond Dynamic Panel Data Estimation						
Explanatory Variable	Dependent Variable: Loan growth					
	1	2	3	4	5	6
$Loangrw_{t-1}$	-0.126 (0.15)	-0.191 (0.179)	-0.279** (0.065)	-0.310*** (0.114)	-0.252** (0.112)	-0.272** (0.115)
$Loangrw_{t-2}$	-0.084 (0.184)	-0.023 (0.211)	-0.104 (0.079)	-0.136 (0.201)	-0.086 (0.180)	-0.148 (0.189)
$Loangrw_{t-3}$		-0.027 (0.141)		-0.289 (0.121)	0.257** (0.115)	-0.261** (0.115)
$Lninfusion_{t-1}$	0.083 (0.099)	0.147 (0.100)		-0.007 (0.130)	-0.018 (0.122)	-0.043 (0.071)
$Lninfusion_{t-2}$	-0.157* (0.094)					
$Lninfusion^2_{t-1}$	-0.005 (0.006)	-0.009 (0.006)		0.0012 (0.008)	0.002 (0.001)	0.003 (0.004)
$Lninfusion^2_{t-2}$	0.012** (0.005)	0.002*** (0.0006)		0.0017*** (0.0005)	0.001*** (0.0005)	0.001*** (0.0006)
$TierI_{t-1}$	3.341 (2.103)					
$CRAR_{t-1}$		3.367*** (0.937)	0.827 (0.626)			
CRARsquared			7.091* (3.989)			
NIM_{t-1}			-0.008 (0.019)			
GNPA ratio			-3.265*** (0.388)			
Stress				-1.890*** (0.437)	-1.874 (0.456)	-1.183*** (0.366)
WALR			-0.679 (0.867)		-5.301 (4.139)	
RoA						0.086** (0.041)
$WALR_{t-1}$					3.103* (1.761)	
GDP	1.872*** (0.518)					
GDP_{t-1}		0.548 (0.893)		-0.2005 (0.814)		
GDP_{t-2}				0.5144 (0.343)		
AQR dummy			-0.228*** (0.042)			
RoA*AQR						-0.106** (0.050)
Lninfusion*AQR	0.006 (0.003)	-0.052* (0.030)		-0.077*** (0.020)	-0.067*** (0.016)	-0.033 (0.035)
$Lninfusion^{2*}AQR$		0.005** (0.002)		0.007*** (0.021)	0.006*** (0.001)	0.004* (0.002)
Stress*Lninfusion*AQR			0.194*** (0.048)			-0.084 (0.082)
CRAR*Lninfusion*GNPA	-0.542 (0.415)	-1.036 (0.703)		-0.483 (0.562)	-0.644 (0.543)	-0.285 (0.955)
Constant	-0.283 (0.652)	-1.037 (0.350)	0.252 (0.107)	0.303 (0.529)	0.632 (0.613)	0.361 (0.308)
Sargan test (p-value)	0.48	0.46	0.23	0.64	0.68	0.70
AR 1 test (p value)	0.06	0.02	0.01	0.03	0.05	0.05
AR 2 test (p value)	0.42	0.18	0.91	0.10	0.11	0.10
No. of observations	63	63	63	63	63	63

No. of instruments	64	64	64	64	64	64
Notes: 1. Figures in parentheses refer to robust standard errors. 2. *p < 0.10, ** p < 0.05, *** p < 0.01						

On interacting capital infusion (in levels) with asset quality review (AQR) dummy, capital infusion was found to be negatively associated with credit growth and was also found to be significant (Col. 2,4 and 5 in Table 1). This shows that in the environment of sharp decline in asset quality due to better classification of assets on account of AQR, despite capital infusion credit supply by PSBs declined. However, if we interact square of capital infusion with AQR dummy, they are found to be positively related and the relation was found to be significant. It suggests that if the capital infusion is of significantly higher amount and above certain threshold, it is able to facilitate credit growth despite regulatory environment such as AQR.

If banks are well capitalised as reflected in higher CRAR, it leads to higher credit growth. If banks are well capitalised they are better able to withstand output shocks and they have to less adjust their lending during economic downturns in order to avoid regulatory capital shortfalls (Gambacorta and Mistrulli, 2004). The relation was found to be significant with one period lag (Col. 2). However, the relationship between CRAR and credit growth may be non-linear as suggested by the coefficient of squared CRAR (Col. 3). This suggests that there may be a threshold level of capitalisation at which the relationship between bank capital and credit growth changes. This relationship is discussed at length in the next section.

High stressed assets (GNPAs plus restructured standard advances) to total advances, which also has negative impact on loan growth through various channels, was found to have expected sign and found to be significant (Col. 4 and 6). Similarly, RoA which is an indicator of profitability, was found to have positive impact on loan growth. If we interact RoA with AQR dummy, it was found to have negative effect on credit growth as positive relationship between earnings and credit growth was overshadowed by negative effect of AQR on bank lending. Among, macroeconomic controls, as expected nominal GDP growth was found to have positive impact on loan growth of banks. However, the endogeneity between the two variables was controlled by the dynamic panel framework of the model.

Testing for the Presence of Threshold level of Bank Capital

Theory, backed by empirical evidence suggests that well-capitalized banks are able to withstand adverse shocks without shrinking their balance sheets, especially their loans portfolio, while capital constrained banks are more likely to deleverage (Cohen, 2013; Armstrong and Ebell, 2014). Labonne and Lame (2014) found a non-linear positive relationship between lending growth and capital ratios in case of French banks with more supervisory capital-constrained banks tending to have a credit growth that is less sensitive to the capital ratio as compared to unconstrained banks. In contrast, Carlson *et al* (2013) found elasticity of bank lending with respect to capital ratios to be higher when capital ratios were relatively low in case of Indonesian banking system.

The lending activity of a capital starved bank may be constrained as it may try to conserve capital to meet the regulatory minimum. Excess capital, if any, may be deployed in relatively less risky sectors or invested in risk-free sovereign paper. Moreover, weakly capitalised banks are perceived as riskier by depositors and investors, increasing their cost of funding through bonds and unsecured deposits, which in turn affects their lending activity adversely. Recent empirical research suggests that relationship between capital and lending may be non-linear; lending growth may pick-up only after bank capital exceeds a critical threshold (Brei *et al*, 2013).

A fixed effect panel threshold regression model following Hansen (1999) using annual data of 40 public and private sector banks for the period 2012-13 to 2018-19 to estimate the relationship between capital (proxied by CRAR) and loan growth. The period starting 2012-13 was chosen as Indian banks started implementing Basel III since 2013. The regression suggested a non-linear relationship between the two. The endogenously estimated single threshold CRAR was found at around 13.1 per cent, which is above the minimum regulatory CRAR (including capital conservation buffer) of 10.875 per cent applicable for March 2019. Double and higher thresholds were rejected as bootstrap p-values were not found to be significant.

The relationship between CRAR and loan growth was found to be positive below the threshold as well as above the threshold. However, if the CRAR was below the threshold, loan growth was higher as compared to when CRAR was above the threshold as indicated by the size of β coefficients. For example, when CRAR is below

the threshold, the estimates suggest that a 1 percentage point increase in CRAR raises bank lending by 1.4–1.7 percentage points (Table 2). However, when capital ratio is above the threshold, the estimates suggest that CRAR had a much more modest impact on bank lending and relationship with loan growth was weak. Thus, beyond the threshold, incremental additions of bank capital have positive but declining marginal effects on lending, which is in line with empirical evidence elsewhere (Catalán *et al,* 2017*)*. These results remain robust even after controlling for net interest margin (NIM), share of liquid assets in total assets, deposit to loan ratio, stressed assets ratio and GDP.

Table 1: Estimates of Panel Threshold Regression Models with Two Regimes			
Model	1	2	3
Dependent variable = Loan growth			
Threshold	13.17 p value= 0.022	13.17 p value= 0.034	13.13 p value= 0.044
CRAR			
β_1	1.495*** (-0.546)	1.395*** (0.56)	1.67*** (0.562)
β_2	0.861* (-0.476)	0.816* (0.49)	1.115** (0.485)
Control variables			
NIM	6.652*** (1.933)	6.467*** (1.835)	
Stress (-1)	-0.527** (0.266)	-0.784*** (0.268)	-0.52** (0.273)
Deposit to loan ratio (-1)		0.130** (0.059)	
Liquid assets to total assets (-1)	0.439** (0.192)		
Nominal GDP growth	0.78 (0.909)	0.992 (0.749)	1.659* (0.902)
Demonetisation dummy	-0.049*** (0.017)		-0.065*** (0.017)
Merger dummy	-0.068 (0.066)		-0.055 (0.067)
AQR dummy	-0.015 (0.017)		0.005 (0.016)
Constant	-0.331*** (0.129)	-0.439*** (0.146)	-0.208 (0.129)
R^2	0.427	0.327	0.316
No. of observations	240	240	240
No. of bootstraps	500	500	500
Prob > F	0	0	0
Note: 1. Figures in parentheses refer to standard errors. 2. *p < 0.10, ** p < 0.05, *** p < 0.01			

In the present Indian context, these results suggest that any amount of recapitalisation in banks is helpful in accelerating credit growth, however 13.1 per cent CRAR would be optimal. Raising capital is costly and also maintaining too much capital would translate to less availability of loanable resources.

Conclusion

The study found that small and intermittent doses of capital injections by the Government in the PSBs over the years, were not helpful in credit growth revival. This result hold true even after controlling for various bank-specific and macroeconomic factors which take care of stress in the banking sector and demand for credit. The paper also asserts that the relationship between bank capital and credit growth is non-linear. Any amount of recapitalisation in banks is may be helpful in accelerating credit growth. However, the study found the single threshold level 13.1 per cent of CRAR level would be optimal. Above this threshold level, incremental increase in bank capital has positive but declining marginal effects on lending as raising capital is costly and also maintaining too much capital would translate into less availability of loanable funds.

References

Acharya, V. V. (2017), 'The Unfinished Agenda: Restoring Public Sector Bank Health in India', R K Talwar Memorial Lecture by Deputy Governor, Reserve Bank of India at Hotel Trident, Mumbai on September 7, 2017, available at https://rbidocs.rbi.org.in/rdocs/Speeches/PDFs/IIBFVA09072017437215FBE69A442CB8E227778F5A2B23.PDF accessed on August 14, 2018.

Armstrong, A and M. Ebell (2014), 'Capital Constraints, Lending over the Cycle and the Precautionary Motive: A Quantitative Exploration,' National Institute of Economic and Social Research, London.

Berrospide, J. M. and M. E. Rochelle (2010), 'The Effects of Bank Capital on Lending: What Do We Know, and What Does It Mean?', *International Journal of Central Banking,* Vol. 6, pp. 5-54.

Brei, M,, L. Gambacorta, G. von Peter (2013), 'Rescue Packages and Bank Lending', *Journal of Banking and Finance*, Vol 37, pp. 490-505.

Catalán, M., A. Hoffmaister, and H. Cicilia (2017), 'Bank Capital and Lending: An Extended Framework and Evidence of Nonlinearity', *IMF Working Paper* No. 17/252.

Cohen, B. H. (2013), 'How Have Banks Adjusted to Higher Capital Requirements?,' *BIS Quarterly Review*, September.

Gambacorta, L. and H.S. Shin (2016), 'Why Bank Capital Matters for Monetary Policy', *BIS Working Paper,* No. 58.

Giannetti, M. and A. Simonov (2013), 'On the Real Effects of Bank Bailouts: Micro Evidence from Japan', *American Economic Journal: Macroeconomics,* Vol 5, pp. 135-167.

Hansen, B. E. (1999), 'Threshold effects in non-dynamic panels: Estimation, testing, and inference,' *Journal of Econometrics*, Vol. 93(2), pp. 345-368, December.

Ministry of Finance (2017): 'Report of the Comptroller and Auditor General of India on Recapitalisation of Public Sector Banks', Report No. 28 of 2017, Performance Audit.