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How Have Indian Banks Adjusted Their Capital Ratios to Meet the Regulatory Requirements? An Empirical Analysis*

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Abstract

The purpose of this study is to examine how the Indian banks have adjusted their risk-based capital ratios during 2009–2018 to meet the regulatory requirements. Banks can, in principle, increase their risk-based regulatory capital ratio, either by increasing their levels of regulatory capital or by shrinking their risk-weighted assets by adjusting asset growth or risk in the portfolio. We investigate banks' capital behavior by decomposing the change in the capital ratio into the contribution of its components and analyzing their variance across regulatory regimes and banks' ownerships. We further investigate how each component of the capital ratio is adjusted by the banks by breaking down them into balance sheet items. We find that the banks' capital behavior significantly differed between public and private sector banks and between the two regulatory regimes. During Basel II, banks, in general, followed a strategy of aggressive asset growth with increased risk-taking. The decline in the CRAR because of such an expansionary strategy was adjusted by augmenting additional capital. However, during Basel III, due to higher capital requirements, both in terms of quantity and quality, banks followed a strategy of cutting back their asset growth and reducing the risk in their portfolio to maintain their CRAR.

Keywords: Capital Adequacy, Basel Accords, Risk, Banking Regulation

JEL Classification Code: G21, G28, G32

1. Introduction

The very nature of banking business brings in many inherent risks and, if such risks are not addressed properly, banks may incur huge unexpected losses. Such losses can impact the sustainability of banking operations. It can even lead to bank failures, loss of confidence in the banking system, and the stability of the entire financial system and

the economy. Banks, therefore, are required to maintain adequate capital to absorb such unexpected losses in order to protect the interest of their stakeholders. The risk-based capital ratio CRAR (capital to risk-weighted assets ratio) introduced by the Basel Committee on Banking Supervision (BCBS) of the Bank for International Settlement (BIS) is one of the widely used measures of capital adequacy of the banks. According to Basel guidelines, banks are required to maintain a minimum capital in relation to its risk-weighted assets all the time. Indian banks too have maintained their CRAR well above the minimum regulatory requirement since the implementation of Basel II rules in March 2009.

Banks can, in principle, increase their regulatory capital ratio CRAR either by increasing their levels of regulatory capital (the numerator of the capital ratio) or by shrinking their risk-weighted assets (the denominator of the capital ratio) (Gropp et al., 2016). The capital can be increased either by increasing their retained earnings and reserves or by issuing equity or other capital instruments. A reduction in risk-weighted assets can be achieved either by reducing the risk in the portfolio or by cutting back loans, investments and off-balance sheets exposures. While raising capital is generally considered as good by the regulators, issuing of new

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shares is not favored by the existing shareholders as it dilutes existing shareholder rights (Andrle et al., 2017). On the other hand, shrinking assets has potential adverse macroeconomic effects if many banks simultaneously engage in cutting their lending. Similarly, adjustments to risk in the banks' portfolio may affect banks' future earnings. It is, therefore, very important for the stakeholders of the banks to know how banks adjust their balance sheets to maintain the desired level of CRAR. It assumes further significance in the wake of the 2008 global financial crisis, which is believed to have been triggered because many internationally active banks built up excessive on- and off-balance sheet leverage, while maintaining a seemingly strong CRAR. However, according to the best of our knowledge, no attempts have been made to assess the adjustment strategies of Indian Banks.

Against this backdrop, this paper aims to investigate how the Indian banks have adjusted their balance sheets, specifically their capital, assets, and risk in their portfolio to maintain the capital ratio at the desired level, using data from a sample of Indian banks for the period 2009–2018. Our sample period covers two regulatory regimes, Basel II from March 2009 to March 2013 and Basel III from April 2013 onwards. Basel III regulatory reform requires banks to maintain higher capital quality and higher capital ratios as one of the key prudential tools (BIS, 2017). As the stakeholders of banks were apprehensive of the potential macroeconomic impact of the banks' possible behavior to meet the higher capital requirements, this paper, specifically studies how the banks have behaved during the two regulatory regimes (Basel II and III). As the literature on various aspects of banking (e.g., Ghosh & Chatterjee, 2015; Kumbhakar & Sarkar, 2003) has well established the existence of ownership effects in the Indian banking system, we further examine how the capital behavior differed between public sector banks (PSBs) and private sector banks (PVBs).

The paper is divided into five sections. After this introduction, in the next section, we present the literature review. The methodology is given in Section 3. Section 4 presents the results and discusses the findings. The final section summarizes the findings of the study.

2. Literature Review

The literature on the capital adequacy of banks is very comprehensive. It shows three main lines of thinking on the optimal capital decisions of banks. The first is commonly known as the *regulatory view*. According to this theory, the regulatory capital requirements as stipulated in the Basel Accord and the safety net in the form of deposit insurance are the two major elements that drive bank capital behavior (Berger et al., 1995). The second is the *buffer* or *discretionary capital view*. In this framework, it is postulated that since issuing fresh equity at a short

notice is costly (Stein, 1998), banks hold excess capital to avoid the associated costs. The third is the *corporate finance view*, which primarily builds on the characteristics of non-financial firms. Three main theories – trade-off theory, pecking order theory, and agency theories – form the core of this view. The pecking order theory is based on information asymmetries and it argues that a firm follows a 'pecking order' in its choice of capital in the sense that it prefers internal to external financing and debt over equity financing, if external financing is employed (Frank & Goyal, 2007). The agency theories deal with the impact of conflicts between shareholders as business principals and the company executives as agents. It particularly addresses the disputes that arise primarily in two key areas: a difference in goals or a difference in risk aversion. The three major forms of such conflict relevant to the capital decision include asset substitution, debt overhang, and free cash flow. Asset substitution refers to replacing riskless assets with risky ones. It has a relevance for banks. The opacity of banks' balance sheets makes it easier to substitute riskless assets with risky ones, as was evidenced during the subprime crisis (Acharya, et al., 2012). The debt overhang or underinvestment refers to the situation where a company is highly leveraged and cannot borrow more money easily to even finance a new investment with positive net present value (NPV). Hanson et al. (2013) point out that debt overhang problems has prevented banks from raising the optimal amount of capital they needed to during the crisis and as a result had to be bailed out by governments.

Most of the empirical studies on bank capital have focused either on exploring the impact of capital adequacy on the operation of banks or on studying the determinants of CRAR by assessing the relationship between capital adequacy ratio and other financial indicators. However, few studies have focused on banks' behavior related to the adjustments to their CRAR. Jackson (1999) studied using supervisory data from a sample of twelve countries whether any increase in CRAR was achieved by increasing capital or reducing lending. Lesle and Avramova (2012) attempted to identify the key factors that drive banks' risk-weighted assets (RWAs) based on a sample of systemically important banks from Europe, North America, and the Asia Pacific. Brunoa et al. (2015) investigated the reliability of RWAs using a sample of 50 large European banks. Cohen (2013) examined how a sample of large global banks from advanced and emerging economies adjusted their capital ratio over the period 2009–2012. Gropp et al. (2016) studied the impact of higher capital requirements on the balance sheets of European banks. In the Indian context, there have been several studies that use CRAR as input for analysing various aspects of the Indian banking sector, but the banks' behavior regarding adjustments to their CRAR is seldom explored.

3. Research Methods and Materials

3.1. Adjustment to the Capital Ratio

As per the Basel Accord, capital adequacy ratio CRAR is calculated as the ratio of total capital (TC) to the total risk-weighted assets (TRWA). In order to assess how banks respond to the capital requirements, we can express CRAR using the following equation

$$CRAR = \left(\frac{TC}{TRWA} \right) = \left(\frac{(TC)}{\left(\frac{TRWA}{TA} * TA \right)} \right) \quad (1)$$

Where TA represents the total assets in the bank's portfolio and the ratio of TRWA to TA represents the risk factor (RD), the level of the risk in the portfolio.

It can be seen from the above equation that a bank that seeks to increase its CRAR can take three possible courses of action: raise capital (increase TC), adjust the portfolio risk factor (lower RD), or shrink total assets (lower TA). Capital can be raised through either equity capital or bank's retained earnings as reserves and surpluses in the form of Tier I capital or by issuing Tier II capital instruments. Increasing capital through retained earnings and reserves involves banks to have strategies to enhance profits. Enhancing profit requires banks to manage their net income through increased lending spread, fees from cross-selling, reducing the operating cost, and provision for bad loans. Alternatively, banks can issue new equity, such as through a rights issue to the existing shareholders or an equity offering in the open market. Banks can also issue Tier II capital instruments such as hybrid debt capital instruments and subordinate debt instruments with certain specific characteristics. Tier I capital is considered as a going-concern capital, as it can absorb losses without triggering bankruptcy and Tier II capital is considered as a gone-concern capital because it will absorb losses only in a situation of liquidation of the bank. Hence an increase in capital through Tier I capital instruments is preferred. Similarly, a bank can seek to reduce the risk in the portfolio by replacing riskier (higher-weighted) loans with less risky loans, or with investment in government securities. Finally, a bank can choose strategies to make changes in asset size such as cutting back loan portfolios by slowing down the credit growth, selling assets outright, reducing the off-balance sheet exposures, etc. Banks may choose one or more of these options depending on their long-term goals, regulatory constraints, and the macroeconomic impact of the chosen strategy.

To identify the above-mentioned strategies of adjustments, we follow the approach of Cohen (2013)

and decompose changes in the CRAR using the following equation derived from equation (1).

$$\Delta CRAR_{ts} = F \left\{ \log \left(\frac{TC_t}{TC_s} \right) - \log \left(\frac{RD_t}{RD_s} \right) - \log \left(\frac{TA_t}{TA_s} \right) \right\} \quad (2)$$

Where $\Delta CRAR_{ts} = CRAR_t - CRAR_s$ and $F = \Delta CRAR_{ts} / \{\log(CRAR_t) - \log(CRAR_s)\}$

3.2. Adjustment Strategy, Regulatory Regime and Banks' ownership

To study how the strategies vary across bank groups and regulatory regimes, we measure and analyze the components of equation (2) for the whole sample period as well as a number of subsamples such as bank groups (PSBs vs PVBs), regimes (Basel II vs Basel III) and each regime for each bank group.

The contributions measured by equation (2) are based on the start and end years of the sample period. However, the strategies may vary from bank to bank and year to year for one bank. We, therefore, further validate our findings using an ANOVA regression model of the following form.

$$\Delta \log COMP_{it} = \alpha + \beta_1 REGIME_{it} + \beta_2 OWN_{it} + \beta_3 REGIME_{it} * OWN_{it} \quad (3)$$

Wherein, the $\Delta \log Comp_{it}$ represents the percentage change to a specific component of CRAR for bank i , in year t . The variable OWN represents the ownership of banks and takes the value 0 for PSBs and 1 for PVBs. The variable REGIME represents the regulatory regimes and takes the value 0 for the Basel II regime (2009–13) and 1 for the Basel III regime (2014–2018).

3.3. Adjustment to the Capital and Assets

Then we decompose the increase in capital and assets into subcomponents to assess the contribution of various balance sheet items using the following equations.

$$\Delta TC_{ts} = \Delta SC_{ts} + \Delta RSRE_{ts} + \Delta OC_{ts} \quad (4)$$

$$\Delta TA_{ts} = \Delta LADV_{ts} + \Delta INV_{ts} + \Delta OFFBE_{ts} \quad (5)$$

Where ΔSC , $\Delta RSRE$, ΔOC represent the change in the share capital (including share premium), reserves and retained earnings, and the other capitals respectively. The $\Delta LADV$, ΔINV , $\Delta OFFBE$ represent the change in loans and advances, investments, and off-balance sheet exposures. Since the breakup of regulatory capital and exposures used

for RWA calculation are not publicly available, we use balance sheet items with appropriate mappings as per the Basel methodology

3.4. Sample Data

For this study, we have collected data on regulatory capital and RWA from the Basel II/III disclosure statements of the 47 major banks from their websites for the period 2019–2018. The data on components of capital and assets were collected from various issues of Statistical Tables Related to Banks in India published by the Reserve Bank of India, which is compiled based on the audited balance sheets of banks. We thus prepared a panel data of 461 bank-years. This includes 23 PVBs and 24 PSBs. The sample was selected in such a way that the selected banks accounts for more than 95 percent of the total assets of all scheduled commercial banks operating in India as of March 2018.

4. Results and Discussion

4.1. Adjustment to the CRAR - Contribution of Capital, Asset Size, and Risk

An empirical analysis of CRAR of banks included in our sample indicates that most banks in India have maintained a CRAR well above the stipulated regulatory requirement throughout the sample period, although it declined with the implementation of Basel III capital norms from 1 April 2013 that warranted higher capital in terms of both quantity as well as quality. The results of the ANOVA regression equation (3) for CRAR as the dependent variable reported

in column 1 of Table 1 reveals that the CRAR of banks, in general, has declined over time, particularly during Basel III regime. The mean CRAR of PSBs, on average, were lower by -1.48 per cent points during Basel III compared to Basel II. Whereas, for PVBs, the CRAR declined only by -0.28 per cent ($-1.48\% + 1.2\%$) in Basel III. The PVBs, in general, maintained a higher CRAR than that of PSBs. During Basel II regime, PVBs on average maintained a higher CRAR of 14.66 per cent compared to 13.03 per cent maintained by PSBs. However, during Basel III regime, the gap further widened as the CRAR of PSBs declined at a higher rate than that of the PVBs.

Figure 1 provides the contribution of change in capital, risk, and asset size to the overall change in CRAR, computed as components of equation (2), for the full sample (2009–2018) as well as for a number of subsamples. The overall change in CRAR is shown by circles on the right-hand scale. The contribution of change in TC, TA, and RD are shown by bars on the left-hand scale. It reveals that the marginal reduction of -0.47 per cent points in the CRAR of Indian banks during the period starting from March 2009 to March 2018 was due to an addition of 13.35 per cent points to CRAR from an increase in the capital and a reduction of 13.81 per cent points due to increased risk level and asset size, which subtracted 1.72 per cent points and 12.09 per cent points respectively from the CRAR. The aggregate data, therefore, indicate that the banks adjusted their capital ratio mainly by augmenting additional capital to match with the increase in asset growth and risk in the portfolio. However, analysis of the contribution of change in the components of CRAR to change in the CRAR over subsamples depicts a different picture altogether.

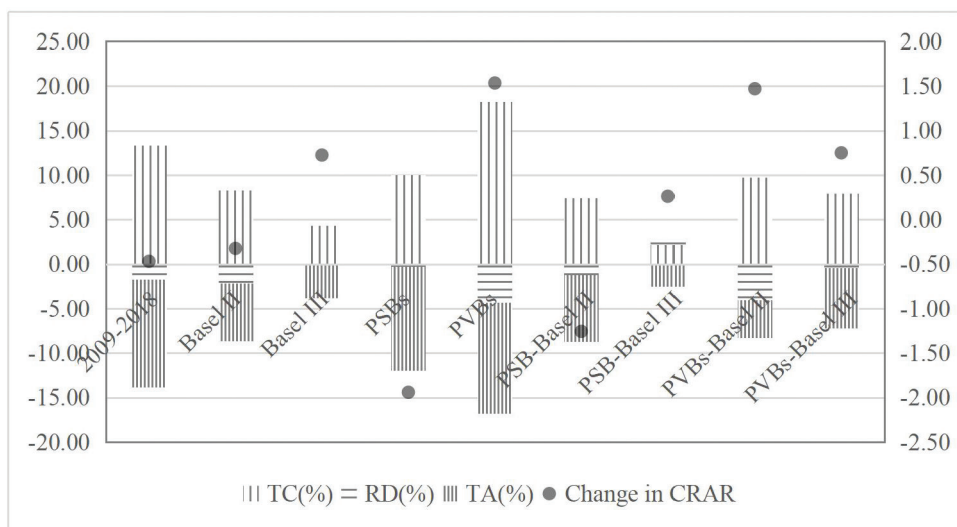


Figure 1: Percentage Contribution of Capital (TC), Assets (TA), and Risk (RD) to the Change in CRAR
Source: Authors' calculation based on secondary data.

A comparison across regulatory regimes indicates that during Basel II, banks followed a strategy of aggressive lending with increased risk taking and augmented additional capital to match with a consequent increase in the RWA. However, during Basel III, banks adopted a strategy of cutting back asset growth and reducing the risk in their portfolio to reduce their RWA. As a result, banks could manage to maintain their capital ratio by augmenting less amount of additional capital during Basel III. Further, it can be noted that the behavior of banks in adjusting their CRAR varied significantly between PSBs and PVBs, that too across regulatory regimes.

The contribution of assets to change in CRAR of PSBs has almost halved during Basel III compared to Basel II with a marginal reduction in the contribution of risk, indicating that PSB resorted to cutting back their asset growth during Basel III to maintain their CRAR. The results of regression equation (3) estimated with growth rate of capital (TC), risk-weighted assets (RWA), assets (TA) and risk (RD) as dependent variables reported in Table 1 further confirm this. During Basel II regime, the risk-weighted assets of PSBs grew at the rate of 17.85 per cent whereas the capital grew only by 15.87 per cent, which resulted in an average CRAR of 13.03 per cent. However, during Basel III regime, the growth in risk-weighted assets of PSBs reduced to 4.55 per cent, a decline of -13.30 per cent compared to Basel II regime. As a result, PSBs could still maintain an average capital ratio of 11.55 per cent (13.03 - 1.48) with just 2.77 per cent (15.87 - 13.10) increase in their capital. The reduction in RWA is attributed to a decline in asset size as well as risk level, although the reduction in the risk level is not statistically significant. Many factors attributed to cutting back the assets during Basel III. First, the aggressive

lending strategy followed by PSBs during Basel II resulted in mounting NPAs, higher provisioning requirements, huge losses and the consequent erosion of capital, which would have resulted in a substantial reduction in their CRAR during Basel III. Second, a higher capital requirement under Basel III norms. The large-scale write-off of NPAs during Basel III regime not only led to a reduction in assets growth, but also to a reduction of risk in their portfolio and thereby improve the CRAR. Therefore, it seems that the agency theory of debt overhauling also explains the capital behavior of PSBs to an extent.

On the other hand, PVBs maintained higher CRAR during both Basel II and III while maintaining the assets growth, although the asset growth declined on average by -4.22 per cent per annum from 13.79 per cent in Basel II to 9.57 per cent in Basel III. At the same time, PVBs augmented capital at a higher pace (by 1.2%) compared to PSBs and achieved an average capital ratio of 14.37 per cent as against 11.55 per cent for PSBs (Table 1). The counter-cyclical lending strategy followed by the PVBs helped them to expand their assets during both periods. However, a reduction in risk in the portfolio played a major role in retaining their CRAR during Basel III. While the asset growth reduced the CRAR to an extent around -4.25 per cent and -6.78 per cent during Basel II and III, respectively, the risk contributed to a reduction of -4.04 per cent and -0.43 per cent in their CRAR during Basel II and III respectively (Figure 1). The reduction in the risk level, despite the asset growth and strengthening of the risk measurement methods under Basel III norms, indicates a possibility that PVBs resorted to asset substitution to increase their CRAR by replacing riskier assets with less risky assets.

Table 1: Results of ANOVA Regressions with Components of CRAR as Independent Variables

	Independent variables				
	CRAR (%)	$\Delta \log$ TC (%)	$\Delta \log$ RWA (%)	$\Delta \log$ TA (%)	$\Delta \log$ RD (%)
C	13.03*	15.87*	17.85*	16.34*	0.02
Regime	-1.48*	-13.10*	-13.30*	-10.13*	-0.03
Ownership	1.63*	1.62	-0.34	-2.55	3.66*
Regime*ownership	1.20*	6.70*	6.73*	5.91*	-1.62
R square	0.19	0.17	0.21	0.09	0.01
F-Statistics	36.21*	28.53*	35.24*	14.09*	1.93

Note: * and ** indicates significant at 5% and 10% level of significance based on t-statistics.

Source: Authors' calculation based on secondary data.

4.2. Adjustments to the Capital

Capital forms the basic requirement for banks, not only to meet the regulatory requirements, but also to expand their balance sheets. In this section, we analyze how banks have adjusted the composition of capital to maintain the desired capital ratio. As in the previous sections, we explore the changes at the aggregate level as well as at the bank level. Figure 2 provides the percentage change in total capital (circles on the right-hand scale) and the contribution of share capital including share premium, accumulated reserves and retained earnings, and other capitals to the increase in total capital for the whole sample as well as for various subsamples. Other capital mostly consists of Tier II capital instruments and is calculated as a residual of the total regulatory capital and sum of the share capital, retained earnings, and accumulated reserves reported in banks’ balance sheet. Table 2 provides the results of the regression equation (3) with the growth rate of these components as independent variables.

It is apparent from Figure 2 that during Basel II, when the banks were more profitable, they increased their capital mainly through reserves and retained earnings, whereas during Basel III, they relied more on share capital. However, it can be noted that PSBs and PVBs have followed different strategies during the two regulatory regimes to augment their capital.

During Basel II, the bulk (85%) of the increase in the capital of PSBs came from share capital and reserves, whereas PVBs had followed a more diversified approach. The results reported in Table 2 also confirm this. During

Basel II, PSBs on average increased share capital at a higher rate of 26.04 per cent per annum as against 17.45 per cent (26.04 – 8.59) raised by PVBs, although the difference is not statistically significant. Although the total reserve and the retained earnings of both groups grew at around 13 per cent, the growth rate of Tier II capital of PVBs was 8.62 per cent points higher than PSBs’. It indicates that, while the reserve and the retained earnings remained a major contributor of bank capital during Basel II regime, PSBs relied more on share capital and PVB on other capitals such as Tier II instruments to meet their additional capital requirements. Perhaps, the better profitability and higher CRAR could have facilitated PVBs to raise capital through Tier II debt instruments. The behavior of PVBs supports the argument that existing shareholders do not favor issuing of new shares as it reduces the returns they can earn.

During Basel III, the strategy of PSBs changed significantly. The share capital remained the major contributor to the increase in the capital of PSBs (Figure 2). Large-scale capital infusion in PSBs by the government to square off the depletion of their reserves and retained earnings due to persisting deterioration in asset quality and incurring of losses was one of the major factors that attributed to the increase in share capital. In fact, the growth rate of reserve and retained earnings of the PSBs were lower by –24.93 per cent when compared to Basel II regime and the same was compensated through share capital (Table 2). The government infused 1,601 billion rupees in PSBs during 2014–2018 as against 477 billion rupees it did during 2009–2013 (RBI, 2017).

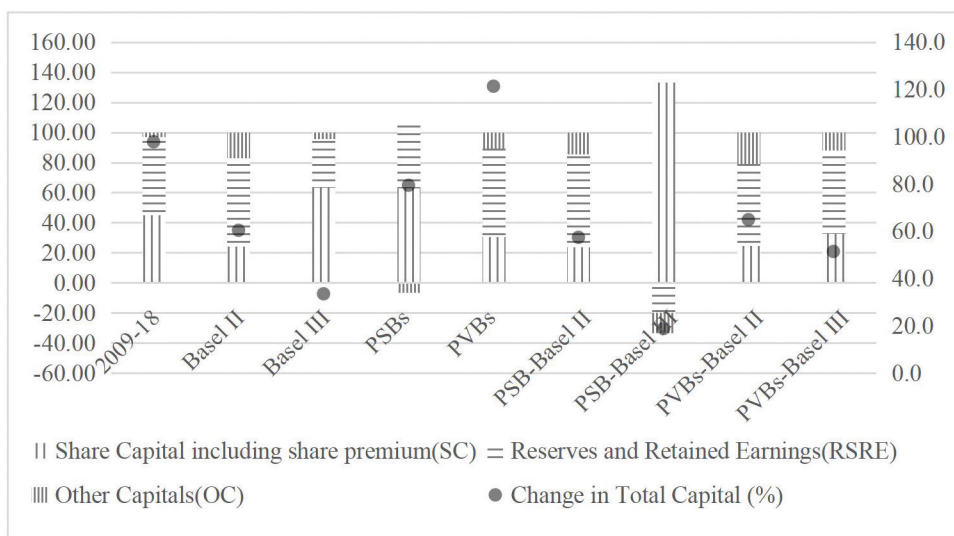


Figure 2: Sources of Increase in the Capital (%)
 Source: Authors’ calculation based on secondary data.

However, a large portion of the infused capital was absorbed into losses incurred by them. The government also allowed PSBs to raise capital from the markets through follow-on public offers (FPOs) or qualified institutional placement (QIP) in August 2016 by diluting the government’s holding up to 52 per cent in a phased manner based on capital requirements. At the same time, the contribution of other capital also declined significantly, mainly due to the stringent norms introduced in Basel III regulation to improve the quality of capital. The Tier II capital, which used to be allowed to the extent of 100 per cent of Tier I capital under Basel II was restricted to

a maximum up to two per cent of RWA. This severely impacted the capital position of PSBs, especially when their Tier I capital had already declined substantially due to losses. The PVBs too had to reduce their Tier II capitals when it got capped under Basel III. While PSBs reduced the Tier II capital on average by –3.57 per cent (7.73 – 11.29) points per annum, PVBs reduced it by –1.28 per cent (7.73 + 8.62 – 11.29 – 6.34) points per annum during Basel III (Table 2). It indicates that the capital behavior of PVBs can be explained by the pecking order theory on capital, which argues that a firm prefers debt over equity if external financing is permitted (Frank & Goyal, 2007).

Table 2: Results of ANOVA Regressions with the Growth Rate of Components of Capital as Independent Variables

	Independent Variables		
	Share capital Including Share Premium ($\Delta \log SC$)	Reserves and Retained Earnings ($\Delta \log RSRE$)	Other Capitals ($\Delta \log OC$)
C	26.04*	12.44*	7.73*
Regime	-4.72	-24.93*	-11.29*
Ownership	-8.59	-0.53	8.62*
Regime*ownership	8.62	18.96*	-6.34
R-square	0.00	0.03	0.09
F-Statistics	0.61	4.75*	12.74*

Note: * and ** indicates significant at 5% and 10% level of significance based on t-statistics.
 Source: Authors’ calculation based on secondary data.

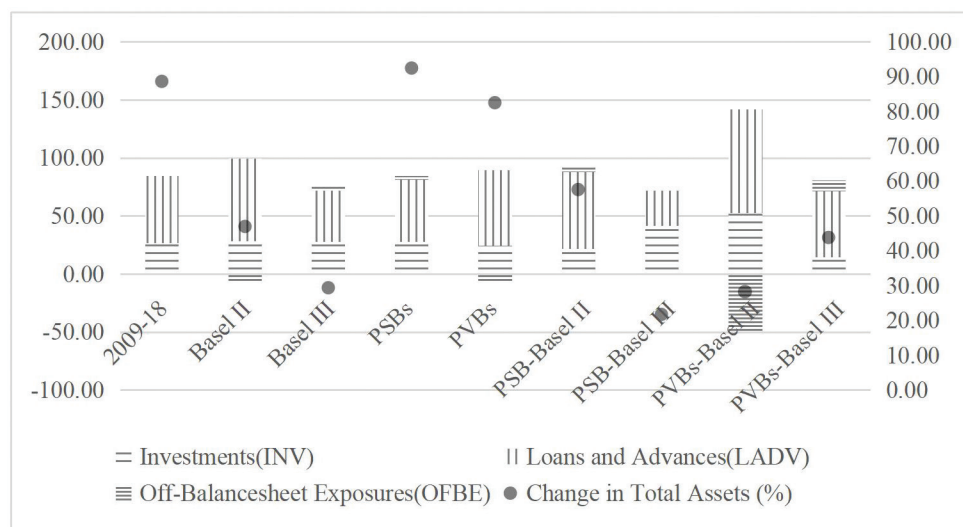


Figure 3: Sources of Increase in Assets (%)
 Source: Authors’ calculation based on secondary data.

4.3. Adjustments to Assets Size

Banks mainly have three options to adjust their asset size: adjustments through loans and advances (LADV), investments (INV), and off-balance sheet exposures (OFBE). OFBE, or contingent liabilities are non-funded exposures which include forward exchange contracts, derivatives for currency and interest rate swaps, currency options, interest rate futures, and letters of credit and guarantees. Figure 3 shows the contribution of LADV, INV, and OFBE to the increase in total assets across various samples.

While loans and advances contributed to 71.37 per cent of the total increase in assets of the banks during Basel II regime, it reduced to 48.17 per cent during Basel III regime, mainly because PSBs resorted to cutting back their loan growth to maintain the desired capital ratio. The results of the regression equation (3) with the annual growth rate of LADV, INV, and OFBE as independent variables reported in Table 3 show that PSBs reduced the growth in investments and OFBE too by -7.94 per cent and -10.96 per cent, respectively, to maintain their CRAR (Table 3, row 3). In fact, during Basel III regime, the growth in loans and advances of PSBs fell, on average, to 3.01 per cent, compared to an annual growth rate of 17.98 per cent registered during Basel II (Table 3).

At the same time, PVBs appear to have followed a mix-and-match strategy based on the economic outlook. Unlike PSBs, PVBs' behavior with respect to asset growth was more counter-cyclical, wherein they reduced growth in their loans and advances when the economic outlook was not so positive, particularly till March 2010, mainly due to increased risk aversion in the wake of the global financial crisis of 2007–2008. However, since 2010–2011, PVBs have recorded significantly higher growth in loans and

advances and, as a result, they could maintain, on average, a higher credit growth during Basel II regime as compared to PSBs, although the difference is not statistically significant. PVBs also increased their investments at a higher pace and off-balance exposures at a slower pace compared to PSBs (Table 3, row 3). The rising interest rates could have been one of the factors that attributed to their strategy of increasing the investments. There are many reasons for slow growth in OFBE of PVBs during Basel II. The PVBs, particularly foreign banks and new generation PVBs have been building up substantial off-balance exposures during 2006–2008, which attracted fewer capital charges, mainly to generate more fee income without affecting their capital adequacy ratio. However, in the backdrop of the global financial crisis, which is believed to have been aggravated by the off-balance sheet operations of the banking system, the Reserve Bank of India tightened the prudential norms for OFBE of the banks. As a result, there was a substantial decline in off-balance exposure in 2008–2009, breaking the trend of increase observed during the earlier period (RBI, 2011). The declining trend in OFBE of banks continued till March 2012. However, unlike PSBs, PVBs continued to expand their loan portfolio and off-balance exposures at a higher rate during Basel III compared to Basel II, but slowed down the growth in their investment by -3.85 per cent during Basel III compared to Basel II, perhaps to benefit from the downward sloping yield curve that had prevailed during Basel III.

Apart from the regulatory capital pressure, other external factors such as demonetization and high level of impairment in the asset quality of the banking sector, which necessitated increased provisioning and the consequent erosion of capital positions of banks, particularly in the case of PSBs, also could have contributed to the slow asset growth during Basel III regime.

Table 3: Results of ANOVA Regressions with Growth Rate of Components of Capital as Independent Variables

	Independent Variables			
	Total Assets ($\Delta \log TA$)	Loans and Advances ($\Delta \log LADV$)	Investments ($\Delta \log INV$)	Off-Balance Exposures ($\Delta \log OFBE$)
C	16.34*	17.98*	15.66*	15.43*
Regime	-10.13*	-14.97*	-7.94*	-10.96*
Ownership	-2.55	1.94	3.12**	-7.16**
Regime*ownership	5.96*	5.73*	-3.84	7.49
R-square	0.09	0.26	0.14	0.01
F-statistics	14.09*	48.66*	21.95*	2.69*

Note: * and ** indicates significant at 5% and 10% level of significance based on t-statistics.

Source: Authors' calculation based on secondary data.

5. Conclusion

In this study, we examined the behavior of Indian banks to adjust their capital ratio after the global financial crisis of 2008. We used data from a sample of 47 major scheduled commercial banks operating in India for the period 2019–2018 covering two regulatory regimes on capital adequacy. We found that most Indian banks have maintained their CRAR well above the stipulated regulatory requirement throughout the sample period, although there was a significant decline in the capital ratio with the implementation of Basel III capital norms, in particular in that of PSBs.

The capital behavior and adjustment strategy of banks differed significantly across the two regulatory regimes as well as across bank groups. During Basel II, banks followed an aggressive lending strategy with increased risk taking, but could maintain their CRAR by augmenting additional capital mainly through the reserve and retained earnings driven by profitability. However, during Basel III, due to higher capital requirements, both in terms of quantity and quality, banks followed a strategy of cutting back their asset growth and reducing the risk in their portfolio to maintain their CRAR. Apart from the regulatory pressure, other external factors such as demonetization and high level of impairment in the asset quality of the banking sector also could have forced banks to slow down asset growth. While PSBs mainly resorted to a strategy of slowing down their asset growth, PVBs focused on reducing the risk in their portfolio also to shrink their RWA to maintain the desired CRAR.

Regarding adjustments to the capital, it was found that during Basel II, the accumulated reserve and retained earnings remained a major source of capital for both PSBs and PVBs, but for additional capital requirements, PSBs relied more on share capital and PVBs on Tier II capital. However, during Basel III, PSBs depended more on capital infusion from the government to meet the capital requirements as their reserves and retained earnings got depleted due to persisting deterioration in asset quality and the consequent losses. For PVBs, accumulated reserves and retained earnings continued to be a major contributor of capital indicating that profitability is indeed a major determining factor of banks' capital behavior. Further, the study revealed that, when Tier II capitals were permitted under Basel II, banks, particularly PVBs, preferred to raise the capital through that channel. However, when Tier II capital was capped under Basel III, banks were forced to replace a major portion of their Tier II capital with Tier I capital, putting pressure on their capital ratio. Banks' behavior concerning Tier II capital confirms that pecking order theory, which argues that a firm prefers debt over equity if external financing is permitted, holds good for Indian banks.

Regarding adjustments to the denominator of the capital ratio, the study revealed that both PSBs and PVBs resorted to

slowing down their asset growth during Basel III mainly by cutting back growth in loans and advances. Banks also resorted to risk reduction to increase their capital ratio. It appears that PSBs achieved the risk reduction by debt overhauling through write-offs of NPAs and PVBs through asset substitution by replacing riskier assets with less risky assets.

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