

## Chapter 2

# EFFECTIVENESS OF MACROPRUDENTIAL POLICIES IN INDIA

By  
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### 1. Introduction

Macroprudential policies are complementary to microprudential, monetary policy and exchange rate policies in safeguarding financial stability and mitigating systemic risk. They work by limiting the build-up of risk from specific sources of financial imbalances and thus improve the resilience of the financial system. They are also helpful in limiting the consequences of busts, by utilizing the buffers they help to build up during boom times. Thus, they work in a counter-cyclical fashion in helping to dampen the credit-cycles.

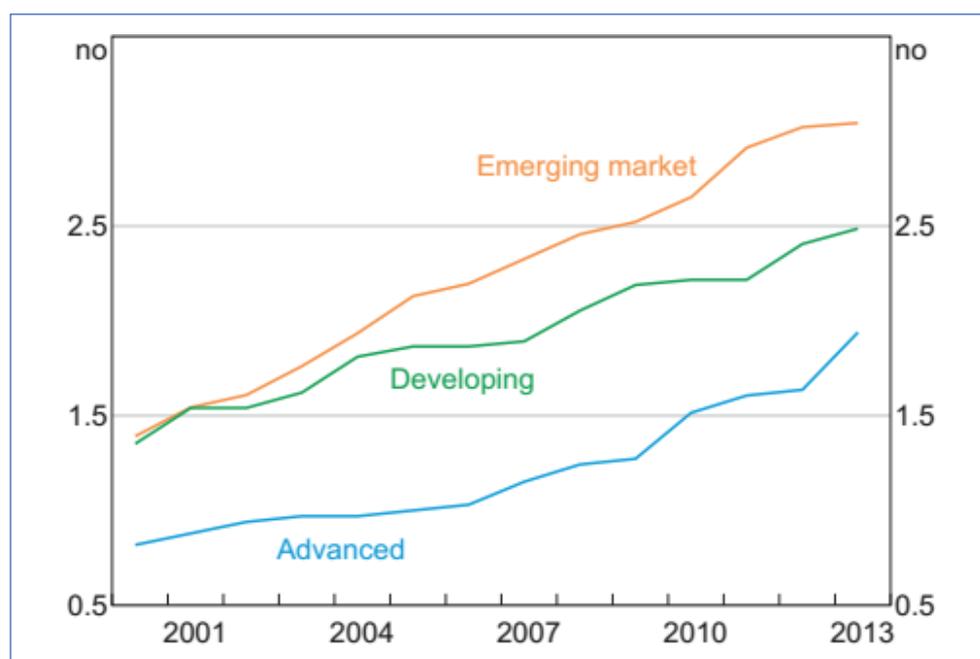
Delineating the distinction between macroprudential and microprudential approaches, Borio (2003) asserts that while the objective of the former is to limit the risk of episodes of financial distress with significant losses in terms of the real output for the economy as a whole, the latter approach tries to limit the risk of financial distress at the level of individual institutions. Further, highlighting the significance of macroprudential tools *vis a vis* monetary policy tools in tackling financial stability issues, the International Monetary Fund (IMF) (2013) argues that monetary policy alone cannot achieve financial stability as the causes of financial instability may not always be related to the degree of liquidity in the system which monetary policy can fix. When financial distortions are more acute in some sectors of the economy than in others, as is often the case, monetary policy is a very blunt tool as it will also affect many sectors in an unintended manner. Thus, price and output stability may conflict with financial stability. In such conditions, having additional tools such as macroprudential ones for financial stability goal may be welfare enhancing.

Macroprudential tools have been particularly useful while dealing with excessive credit growth in specific sectors. Shin (2010) argues that the interconnectedness of financial institutions increases with excessive growth in assets held by financial institutions. An effective macroprudential policy may help in addressing it. The experience of the global financial crisis showed that even if the individual financial institutions are in sound and healthy condition, the financial system as a whole may be vulnerable to systemic risk. This underscores the importance of macroprudential supervision of financial institutions.

India is among the fore-runners in the implementation of macroprudential policies. It has been observed that macroprudential tools have been used more often in emerging and developing economies as compared to advanced economies (Orsmond and Price, 2016) (Chart 1).

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**Chart 1: Use of Macroprudential Tools\* - By Economy Type**

\* Use is measured by the average number of tools used per economy type; economy types are defined using the October 2016 IMF *World Economic Outlook* and World Bank publications

Source: Orsmond and Price, 2016.

The rest of the paper proceeds as follows: Section 2 discusses the various literature on effectiveness of macroprudential policies in curbing excessive credit growth and significance of their coordination with monetary policy. In Section 3, various macroprudential tools used in India are discussed. In Section 4, the empirical part related to the effectiveness of macroprudential policies in India is presented. The conclusion is given in the last section.

## 2. Literature Review

There is a rich strand of literature on the effectiveness of macroprudential policies in curbing excessive credit growth in recent years, particularly pertaining to emerging market economies (EMEs). In many works that have cross-country analysis, India has been part of the country data-sets used. However, this author did not find any specific literature on the effectiveness of macroprudential policies on credit growth in India.

Using a panel of 13 Asian economies (including India) and 33 other advanced and emerging economies, Zhang and Zoli (2014) found that macroprudential policy has contributed in reducing credit growth in Asia. However, only housing-related measures such as loan-to-value (LTV) ratios, debt-to-income (DTI) ratios, risk weights and loan loss provisions on mortgage loans were found to have a significant impact. Changes in reserve requirements and capital regulation were not found to have any significant effect on bank credit. Lim et al. (2011), using a panel of 49 countries, also had similar findings. However, they also found reserve requirements and dynamic provisioning to be effective in reducing pro-cyclicality of credit. Further, they also found that the effectiveness of the instruments does not depend on the exchange rate regime and the size of the financial sector.

Using a dataset provided by IMF on macroprudential policies, Arregui et al. (2013) found that LTV limits, reserve requirements and risk weights were effective in reducing credit growth and house price growth. However, tightening in provisioning was not always found to be significant. Similarly, Kuttner and Shim (2012) by using various housing-related macroprudential measures for 57 advanced and emerging market economies for the period 1980–2011, found that these measures are quite effective in dampening growth in housing prices and housing credit. The LTV ratio and exposure limits on banks to the housing/property sector were not found significant. However, jointly the prudential variables related to housing were found to be significant. Further, Dell’Ariccia et al. (2012) found that macroprudential policy can contain credit booms and limit the adverse consequences of busts. However, they argued that it may be difficult to stop a credit boom through macroprudential measures alone in small, financially open economies. Hence, they underlined the importance of coordination with exchange rate and fiscal policies in case of externally funded credit growth.

Claessens et al. (2014) looked at 48 advanced economies and EMEs for 2000–2010 using bank level data and found that measures aimed at borrowers such as caps on DTI and LTV ratios and at financial institutions such as limits on credit growth and foreign currency lending are effective in reducing asset growth. They found that these tools help reduce risks during upswings. In contraction phases, however, these macroprudential tools were less effective in maintaining financial intermediation. Cerutti et al. (2015) covering 119 countries over the period 2000–13 also had a similar finding with regard to the effectiveness of macroprudential policies over the business cycle. Further, they found a statistically significant negative relationship of various macroprudential instruments with credit growth. However, the relationship was strongest for EMEs, and much less so for advanced economies which reflects the high reliance of EMEs on macroprudential policies than of advanced economies. Also, according to them, the more developed financial systems of advanced economies offer various alternative sources of finance and scope for circumvention, possibly making it harder for macroprudential policies to be effective.

Gomez et al. (2017) found that, in case of Colombia which used countercyclical reserve requirement and dynamic provisioning scheme for commercial loans for 2006–09 employing loan-account level data, aggregate macroprudential policy stance worked effectively in stabilizing credit cycles and in reducing bank risk-taking. They also underscored the importance of coordination with monetary policy in moderating the credit growth. Tressel and Zhang (2016) found that in the case of the Euro area using Euro-system Bank Lending Survey, that instruments targeting the cost of bank capital were most effective in slowing down mortgage credit growth, and that the impact was transmitted mainly through price margins, the same banking channel as monetary policy. Limits on loan-to-value ratios were also found to be effective, especially when monetary policy was excessively loose.

Erdem et al. (2017) using data of 30 EMEs (including India) for 2000–13 and applying panel vector auto-regression (VAR) found that macroprudential policies are effective in limiting domestic credit growth especially during the expansion phase of the credit cycle. The number of macroprudential tools also matter to better manage the domestic credit growth, since insufficient number of measures were unable to prevent leakages and reduce the effectiveness of macroprudential policies under a global liquidity shock. Akinci and Olmstead-Rumsey (2017) constructed an index of macroprudential policies in 57 advanced and emerging economies for 2000–13 and found that macroprudential tightening was associated with lower bank credit growth, housing credit growth, and house price appreciation. Further, tools specifically intended to limit house price appreciation were found to be more effective, especially in economies where bank finance was important.

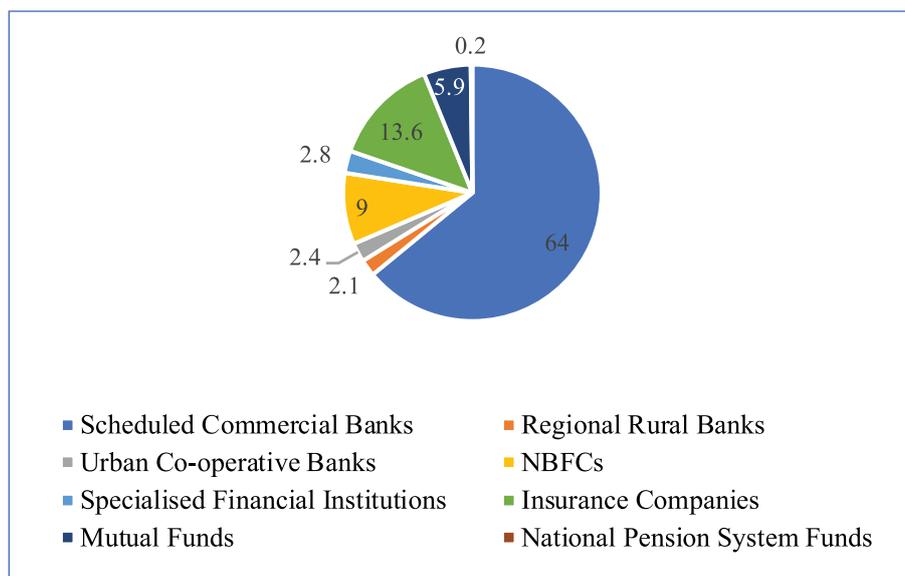
Bruno et al. (2017) analyzing the impact of broadly defined macroprudential and monetary measures (other than policy rate changes) taken in 12 Asia-Pacific economies (including India) over 2004–2013 found that the impact of such measures is ambiguous as they tend to have a positive or insignificant impact on cross-border lending and bank credit which may indicate limitations of macroprudential policy measures. However, using bank-level credit data showed significant effects of domestic macroprudential policies on banks' total asset growth and their leverage. Further, they found high correlations between interest rate policy and banking sector capital flow management policies and domestic macroprudential policies, suggesting macroprudential policies are more successful when they complement monetary policy.

### 3. Macroprudential Regulation in India

Macroprudential regulation has been undertaken to address both dimensions of systemic risk i.e., time dimension and cross-sectional dimension. The time dimension of systemic risk is closely related to pro-cyclicality of credit growth. Financial imbalances build up gradually over time when financial institutions become very aggressive in risk taking so that their leverage, liquidity, and prices of securities and real estate rise sharply in a relatively very short span of time. However, during the down-swing phase, the trend reverses triggering a fall in asset prices, resulting in devastating deleveraging and liquidity squeeze which may result in a financial crisis. The cross-sectional dimension is related to the distribution of systemic risk in the financial system. It is closely related to the concept of inter-connectedness of financial institutions. When an individual financial institution fails, it rapidly contaminates other institutions through various inter-linkages such as counter-party risk, asset fire sales, liquidity crisis, etc. Thus, common exposure to financial market shocks or adverse macroeconomic developments affect a range of financial intermediaries and markets at the same time.

In India, most of the macroprudential measures have been applied primarily on commercial banks (including regional rural banks) as they are central to the Indian financial system, occupying 66.1% of the total assets of the financial system (Chart 2). Non-bank Financial Companies (9%) are also an important component of the financial system. Non-deposit taking systemically important NBFCs which constitute 86% of the total assets of the NBFC sector are closely monitored in view of their systemic importance. However, the paper mainly focuses on macroprudential measures applicable to banks only.

**Chart 2: Share of Different Sectors in Total Assets of Indian Financial System (In %)**

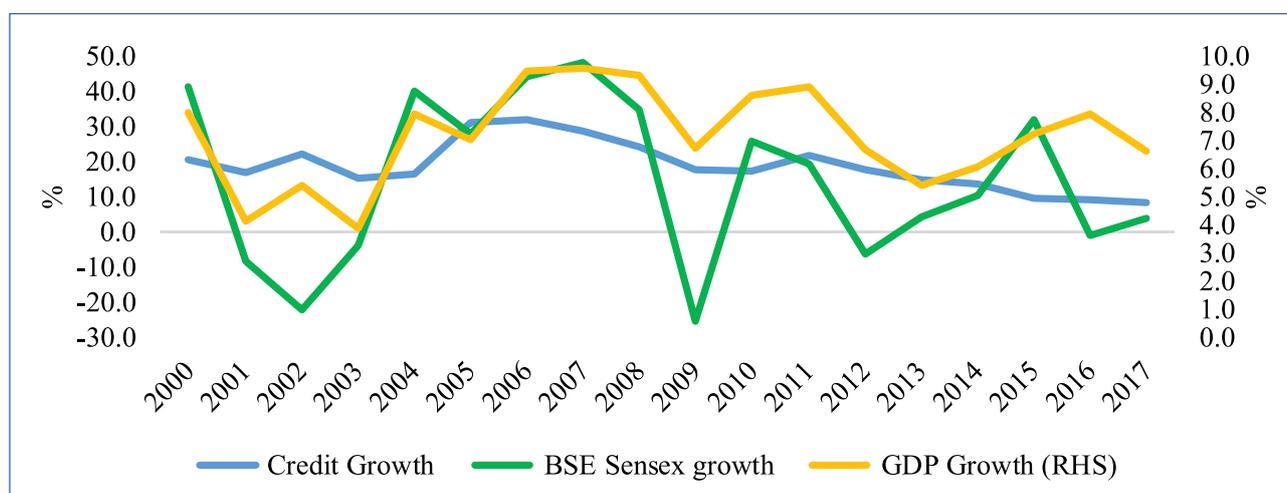


Source: Reserve Bank of India (2014).

### 3.1 Macroprudential Measures Taken in India – Time Dimension of Systemic Risk

**Time-varying Risk Weights and Provisioning Norms:** Counter-cyclical provisioning and differentiated risk weights for certain sensitive sectors were adopted in 2004 to counter pro-cyclical trends (Chakrabarty, 2014). The sectors included residential housing, other retail sector, commercial real estate (CRE), capital market and systemically important non-deposit taking non-bank financial companies (NBFCs). During 2004-08, the Indian economy was going through an expansionary phase with GDP growth of more than 7%. The overall credit also exhibited excessive growth (Chart 3). Advances to sectors such as housing and CRE grew by more than 50% year-on-year. This period was also marked by high capital flows. This exposed the banking sector to various risks associated with costly balance sheet imbalances and asset price booms.

**Chart 3: Growth in GDP, Credit and BSE Sensex**



Source: <https://dbie.rbi.org.in>.

In order to protect banks' balance sheets against such risks, the Reserve Bank raised risk weights from 50% to 75% in the case of housing loans and from 100% to 125% in the case of consumer credit including personal loans and credit cards with effect from December 2004. Further, risk weights for banks' exposure to CRE were increased from 100% to 125% in July 2005, and further to 150% in May 2006. Later in May 2008, the risk weights on housing loans of up to Rs. 3 million with loan-to-value (LTV) ratio of less than or equal to 75 were reduced to 50% from 75 %, while the risk weights on individual housing loans with LTV ratio higher than 75% were raised to 100%. Simultaneously, as equity prices started rising sharply and there was a boom in consumer credit, risk weights on consumer credit and capital market exposures were increased from 100% to 125% (Table 1, Chart 4).

**Table 1: Countercyclical Prudential Regulation:  
Variations in Risk Weights and Provisioning Requirements**

%

Date	Capital Market		Housing		Other Retail		Commercial Real Estate		Non-Deposit taking Systemically Important NBFCs	
	Risk Weight	Provisions	Risk Weight	Provisions	Risk Weight	Provisions	Risk Weight	Provisions	Risk Weight	Provisions
Dec-04	100	0.25	75	0.25	125	0.25	100	0.25	100	0.25
July-05	125	0.25	75	0.25	125	0.25	125	0.25	100	0.25
Nov-05	125	0.40	75	0.40	125	0.40	125	0.40	100	0.40
May-06	125	1.00	75	1.00	125	1.00	150	1.00	100	0.40
Jan-07	125	2.00	75	1.00	125	2.00	150	2.00	125	2.00
May-07	125	2.00	50-75@	1.00	125	2.00	150	2.00	125	2.00
May-08	125	2.00	50-100@	1.00	125	2.00	150	2.00	125	2.00
Nov-08	125	0.40	50-100@	0.40	125	0.40	100	0.40	100	0.40
Nov-09	125	0.40	50-100@	0.40	125	0.40	100	1.00	100	0.40
Dec-10	125	0.40	50-125@	0.40-2.00#	125	0.40	100	1.00	100	0.40
June-13	125	0.40	50-75@	0.40-2.00#	125	0.40	75*	0.75*	100	0.40
Oct-15	125	0.40	35-75@	0.40-2.00#	125	0.40	75*	0.75*	100	0.40
June-17	125	0.40	35-50@	0.25	125	0.40	75*	0.75*	100	0.40

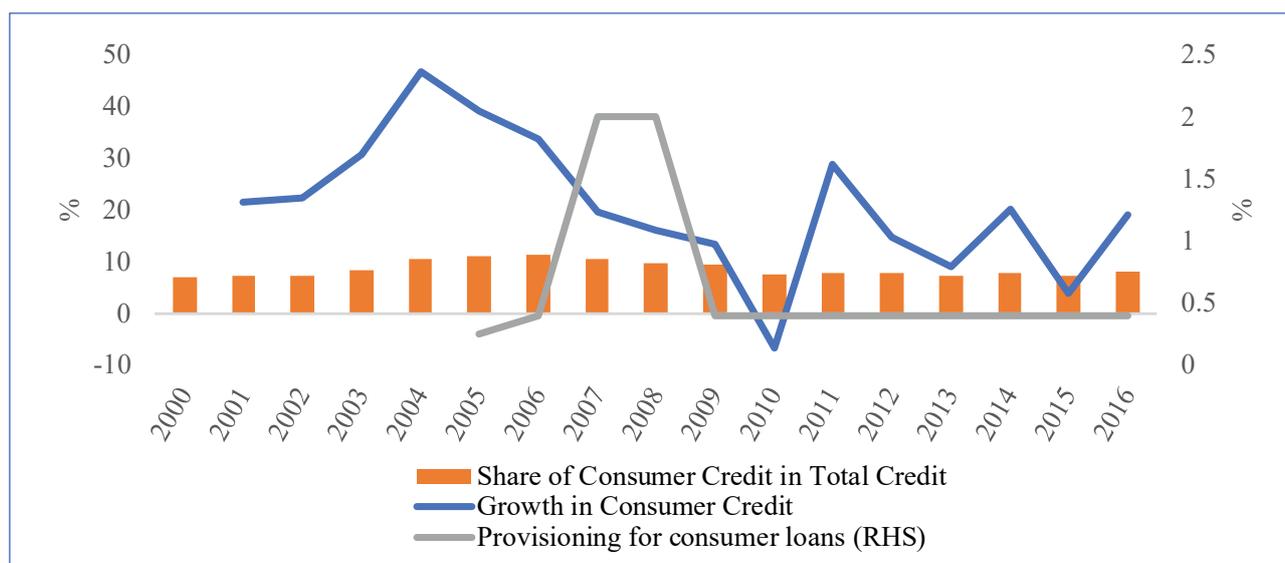
Notes:

\*: Commercial Real Estate- Residential Housing (CRE-RH). For other CRE risk weight and provisioning requirement remained unchanged.

#: Provisioning requirement for housing loans with teaser interest rates was increased to 2.0% in December 2010. In June 2013 and October 2015 review, 2% provisioning requirement on teaser loans remained in force. For other housing loans the provisioning at 0.4%.

@: The risk weights for housing loans vary according to amount of the loan and the loan to value ratio.

Source: Reserve Bank of India and Sinha (2011).

**Chart 4: Effectiveness of Macroprudential Measures- Consumer Loans**

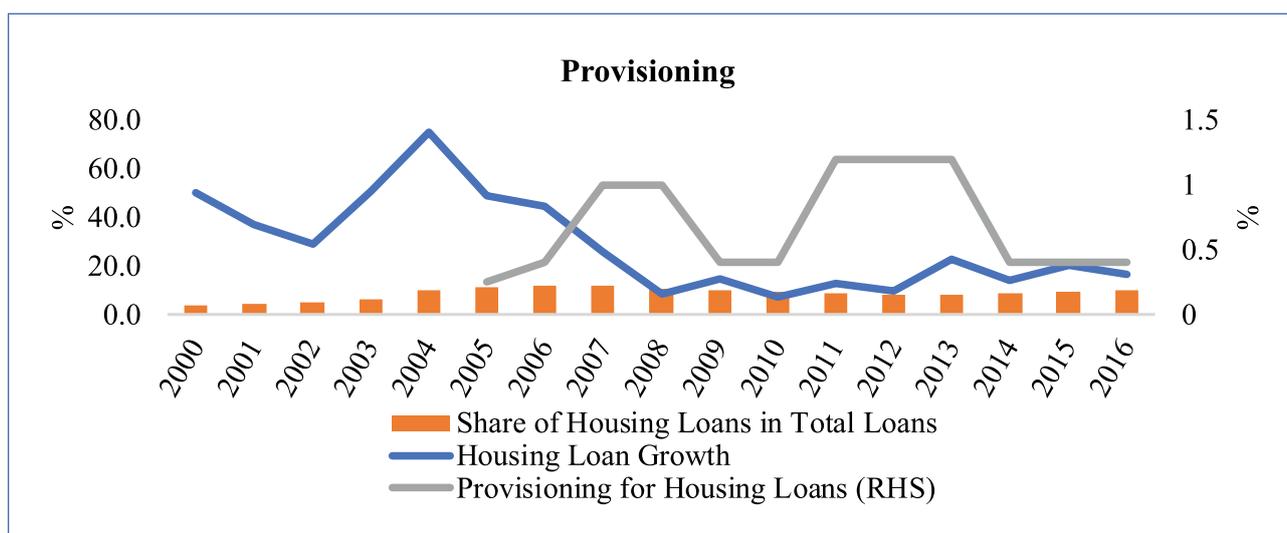
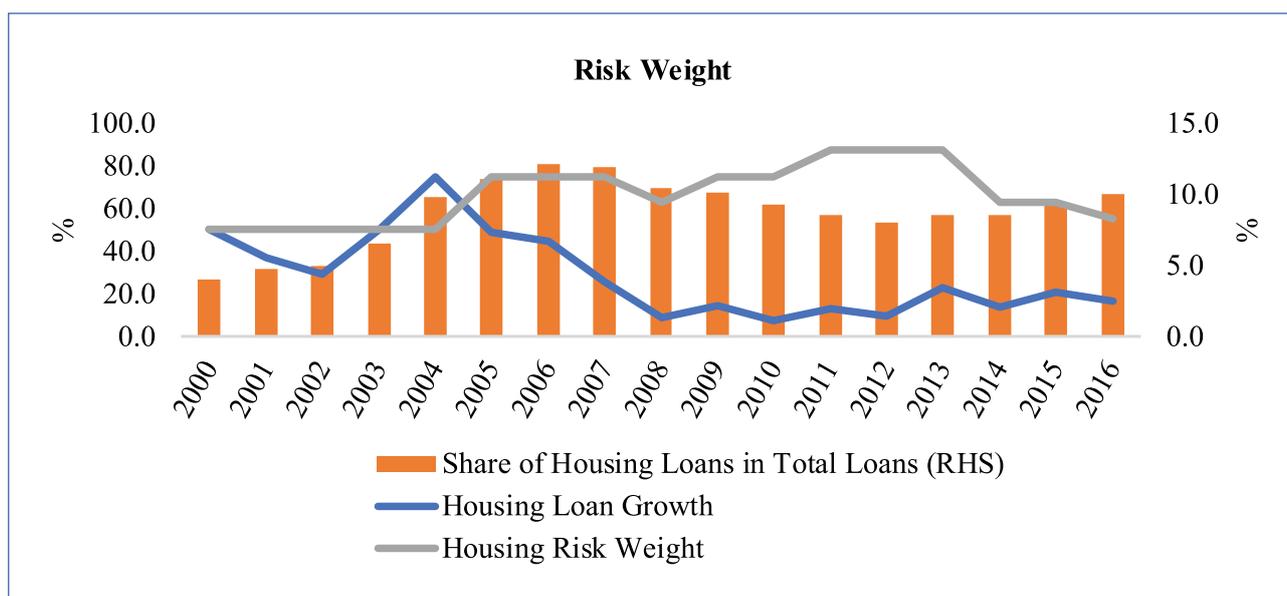
Source: Reserve Bank of India.

Similarly, in view of the excessive growth in credit to non-deposit taking systemically important NBFCs, provisioning on loans to these NBFCs was raised to 0.40% from 0.25% in November 2005 and further to 2% in January 2007 which was later restored to 0.40% in November 2008.

When the global economic crisis started impacting the domestic financial system and other parts of the economy in 2008, some of the pre-crisis tightening measures were relaxed in a counter-cyclical manner, easing both risk weights and provisioning for standard assets. The prudential framework for restructuring of advances was also modified to facilitate viable units facing temporary difficulties to tide over the crisis situation. By late 2009, credit growth began to recover especially in the CRE segment prompting the Reserve Bank to increase the standard asset provisioning requirements for the sector (Chakrabarty, 2014). Further, in December 2010, in order to prevent excessive speculation in the high value housing segment, the risk weights for residential housing loans of Rs.75 lakh and above, irrespective of the LTV ratio, were raised to 125% from 100%. Similarly, in view of the high risk associated with ‘teaser loans’<sup>2</sup>, the standard asset provisioning on the outstanding amount was increased from 0.40% to 2.00% during the same period. The provisioning on these assets were to revert to 0.40% after 1 year from the date on which the rates are reset at higher rates if the accounts remain ‘standard’. Further, with a view to rationalize risk weights on high value individual housing loans, risk weight on loans above Rs.7.5 million was brought down to 75% from 125% in June 2013 (Chart 5).

2. In 2010, some banks were following the practice of sanctioning housing loans at teaser rates i.e., at comparatively lower rates of interest in the first few years, after which rates were reset at higher rates. This practice raised concern that some borrowers may find it difficult to service the loans once the normal interest rate, which was higher than the rate applicable in the initial years, would become effective. It was also observed by the Reserve Bank that many banks at the time of initial loan appraisal did not take into account the repaying capacity of the borrowers at normal lending rates.

**Chart 5: Effectiveness of Macroprudential Measures - Housing Loans**



Source: Reserve Bank of India.

In October 2015, risk weights were further rationalized for housing loans above Rs. 3 million and up to Rs. 7.5 million, reducing to 35% for LTV ratio up to 75%. Further, in June 2017, risk weights and provisioning on standard assets on certain categories of individual housing loans were reduced with a view to providing a boost to the housing segment (Table 2).

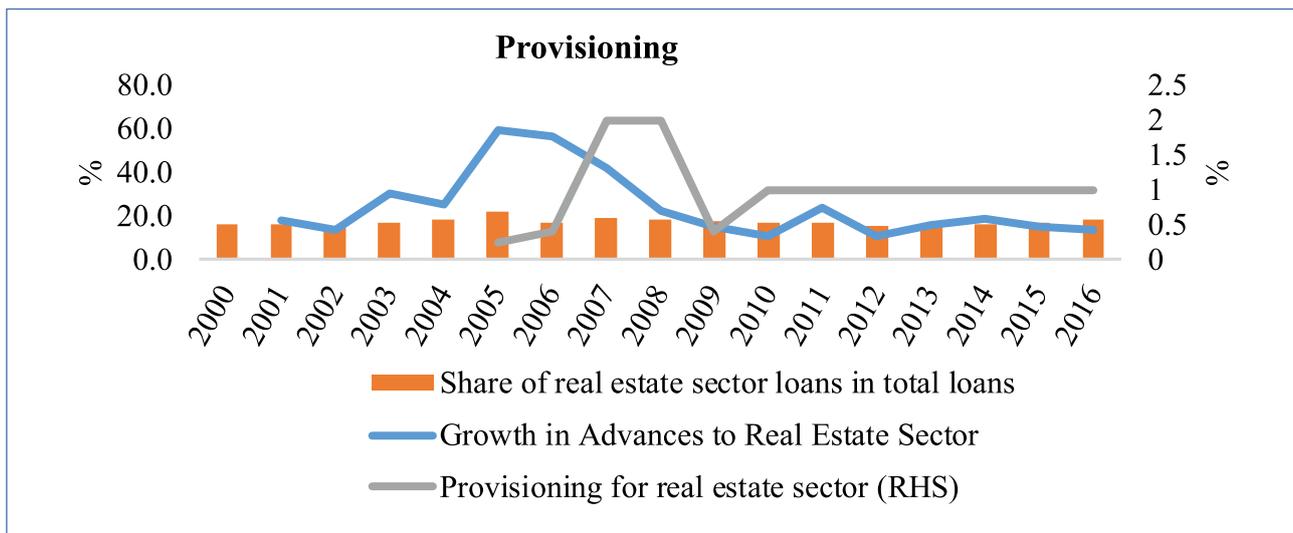
**Table 2: Differentiated Risk Weights for Housing Loans**

Period	Loan Amount	Loan-to-value (LTV) Ratio (%)	Risk Weight (%)
May-08	Up to Rs.3 million	LTV Ratio = or < 75	50
	Above Rs.3 million	LTV Ratio = or < 75	75
	Irrespective of the amount	LTV Ratio > 75	100
Dec-10	Rs. 7.5 million and above	-	125
	LTV Ratio in general should not exceed 80%. However, LTV ratio for housing loans up to Rs. 2 million should not exceed 90 %.		
Jun-13	Up to Rs. 2 million	90	50
	Above Rs. 2 million and up to Rs. 7.5 million	80	50
	Above Rs.7.5 million	75	75
Oct-15	Up to Rs.3 million	≤ 80	35
		> 80 and ≤ 90	50
	Above Rs. 3 million and up to Rs 7.5 million	≤ 75	35
		> 75 and ≤ 80	50
	Above Rs 7.5 million	≤ 75	75
Jun-17	Above Rs. 3 million and up to Rs 7.5 million	≤ 80	35
			35
	Above Rs.75 lakh	≤ 75	50

Source: Reserve Bank of India.

In June 2013, a separate sub-sector called Commercial Real Estate – Residential Housing (CRE-RH) was carved out of the CRE Sector as loans to the residential housing projects under the CRE sector exhibited lesser risk and volatility than the CRE sector taken as a whole. CRE-RH consists of loans to builders/developers for residential housing projects (except for captive consumption) under the CRE segment. The CRE-RH segment was put with lower risk weight of 75% and lower standard asset provisioning of 0.75% against 100% and 1.00%, respectively for the CRE segment (Chart 6).

**Chart 6: Effectiveness of Macroprudential Measures - Commercial Real Estate Loans**



Source: Reserve Bank of India.

According to the Reserve Bank guidelines, with effect from October 20, 2016 exposure to housing finance companies (HFCs) has to be risk weighted as per the rating assigned by the rating agencies registered with Securities and Exchange Board of India (SEBI) and accredited by the Reserve Bank of India which is the prevailing practice in lending to corporates.

In India's case, both monetary policy and macroprudential policy complemented each other. During September 2004 - August 2008, monetary policy was in tightening phase to contain the demand pressures. During this period, repo rate was raised by 300 basis points. In this period, provisioning on standard assets on housing loans and commercial real estate were raised by 75 basis points and 175 basis points, respectively. Similarly, risk weights on various segments were raised during this period. During the easing phase of October 2008 - April 2009, both policy rates and risk weights and provisioning norms in various segments were also loosened. Further, in most of the later tightening and loosening phases of monetary policy, it was in sync with macroprudential policy (Table 3).

**Table 3: Coordination between Monetary and Macroprudential Policies**

(Change in basis points)

	Monetary tightening phase	Monetary easing phase	Monetary tightening phase	Monetary easing phase	Monetary tightening phase	Monetary easing phase
	(September 2004 – August 2008)	(October 2008 – April 2009)	(October 2009 – October 2011)	(January 2012 – May 2013)	(July 2013 – January 2014)	(January 2015 – till date)
<b>Monetary Measures</b>						
Repo rate	300	-425	375	125	75	200
Reserve repo rate	125	-275	425	125	75	125
Cash reserve ratio	450	-400	100	150	0	0
<b>Provisioning Norms</b>						
Capital market exposures	175	-160	0	-	-	-
Housing loans	75	-60	160*	160	160	15-175 reduction
Other retail loans	175	-160	0	-	-	-
Commercial real estate loans	175	-160	60	-	-	-
Non-deposit taking systemically important non-financial companies	175	-160	0	-	-	-
<b>Risk Weights</b>						
Capital market exposures	25	0	0	-	-	-
Housing loans	-25 to 25@	0	0-25#	-	0-50 reduction	15
Other retail loans	25	0	0	-	-	-
Commercial real estate loans	50	-50	0	-	-	-
Non-deposit taking systemically important non-financial companies	25	-25	0	-	-	-

**Notes:**

\*: Provisioning requirement for housing loans with teaser interest rates was increased to 2.0% in Dec 2010.

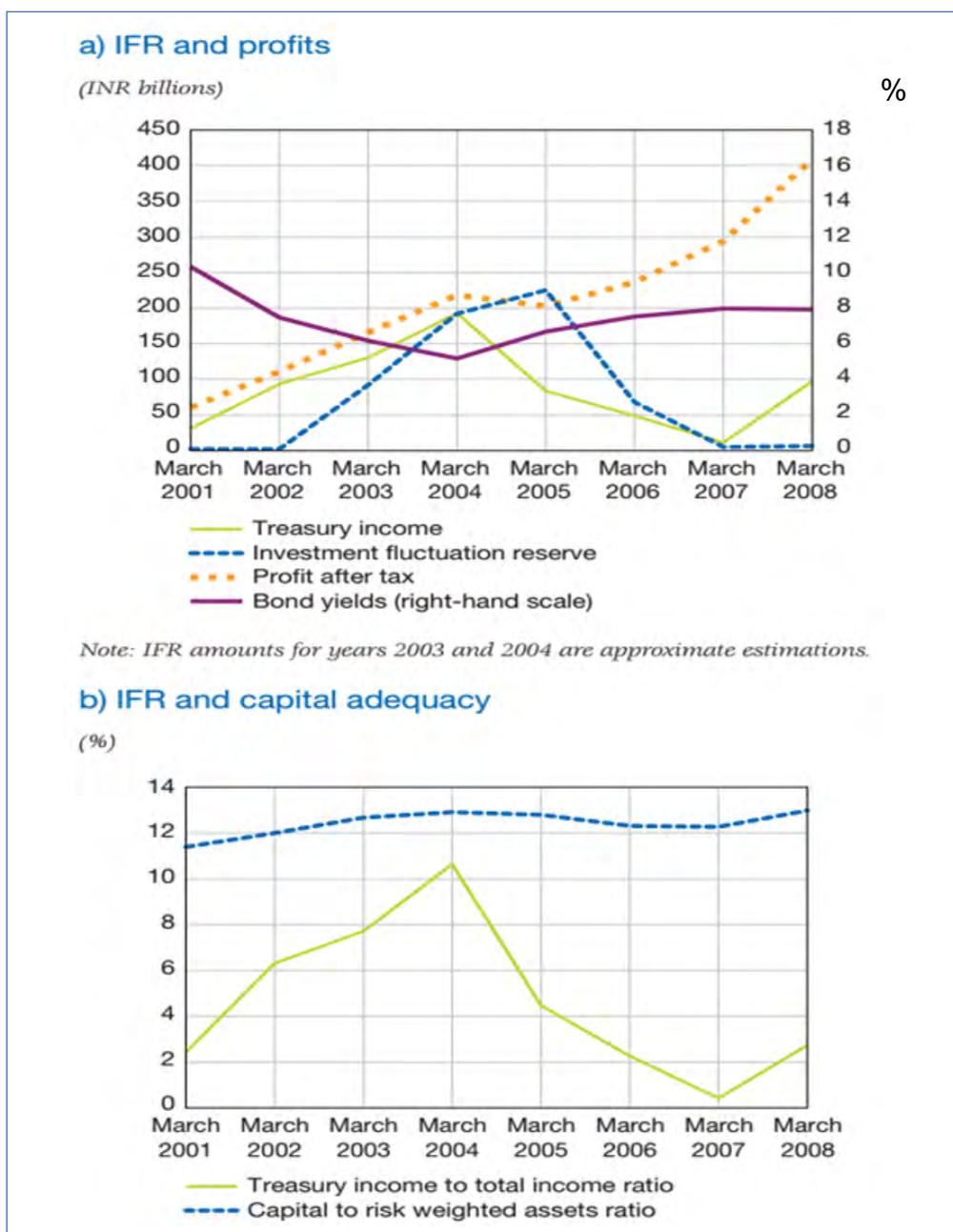
@: Risk weights on housing loans of relatively smaller size classified as priority sector was reduced from 75% to 50% in May 2007, which was not a countercyclical measure but rather an attempt to align the risk weights on secured mortgages with the provisions of Basel II which was to be implemented with effect from March 2008. On the larger loans and those with LTV Ratio exceeding 75% the risk weight was increased from 75% to 100%.

#: The risk weight on loans above Rs. 7.5 million was increased to 125%.

Source: Reserve Bank of India and Sinha (2011).

**Investment Fluctuation Reserve:** In the early 2000s, banks were gaining significantly from falling interest rates (Chart 7). With a view to building up adequate reserves to guard against any possible reversal of interest rate loosening cycle in the future, banks were advised to build up the Investment Fluctuation Reserve (IFR) to a minimum of 5% of their total investments by transferring the gains realized on sale of investments within a period of five years. The IFR was allowed to be drawn down when the interest rate cycle turned and treasury incomes started falling. Further, banks were advised in October 2005 that, if they maintained capital of at least 9% of the risk weighted assets for both credit risk and market risks for both Held for Trading (HFT) and Available for Sale (AFS) category as on March 31, 2006, they would be permitted to treat the entire balance in the IFR as Tier I capital. For this purpose, banks could transfer the balance in the IFR ‘below the line’ in the Profit and Loss Appropriation Account to Statutory Reserve, General Reserve or balance of Profit & Loss Account.

**Chart 7: Investment Fluctuation Reserve**



Source: Chakrabarty (2014).

**Provisioning Coverage Ratio:** The Reserve Bank asked banks to ensure that Provisioning Coverage Ratio (PCR), including floating provisions, is not less than 70% with a view to augmenting provisioning buffer in a counter-cyclical manner when the banks were making good profits, which can be used for absorbing losses during a downturn. Accordingly, banks were advised to achieve this norm not later than end-September 2010. The PCR of 70% may be with reference to the gross non-performing assets (GNPA) position in banks as on September 30, 2010. Excess of provisions for PCR over that required, under prudential norms, would be segregated into a “counter-cyclical provisioning buffer”. This buffer is used by banks for making specific provisions for NPAs during periods of system-wide downturn, with the prior approval of the Reserve Bank.

**Cash Reserve Ratio:** Cash reserve ratio (CRR) is the average daily balance that a bank is required to maintain with the Reserve Bank as a share of its net demand and time liabilities (NDTL). Although the CRR has mostly been used as a monetary policy tool, it has macroprudential impacts as well. Reserve requirements serve a counter-cyclical role for managing the credit cycle in a broad context. In the upswing, hikes in reserve requirements may increase lending rates, slowdown credit, and limit excess leverage of borrowers in the economy, thus acting as a speed limit. In the downswing, they can ease liquidity constraints in the financial system, thus operating as a liquidity buffer (Tovar, et al., 2012).

**Statutory Liquidity Ratio:** Statutory liquidity ratio (SLR) is the share of NDTL that a bank is required to maintain in safe and liquid assets, such as unencumbered government securities, cash and gold. They work similarly to reserve requirements as a prudential tool in a counter-cyclical fashion.

**Liquidity Coverage Ratio:** Liquidity coverage ratio (LCR) is intended to promote short-term resilience of banks to potential liquidity disruptions. LCR requires the banks to have adequate high quality liquid assets (HQLAs) to withstand a 30-day liquidity shock. Though both SLR and LCR are microprudential in nature, these liquidity ratios have some macroprudential characteristics as well and hence, are capable of mitigating systemic liquidity risk as they mitigate negative effects from market illiquidity and excessive maturity and liquidity mismatches (ECB, 2012). As part of Basel III implementation, the LCR has been binding on Indian banks since January 1, 2015. The LCR requirement was a minimum of 60% for the calendar year 2015 and to rise by 10 percentage points each year to reach 100% by January 1, 2019. Currently, banks have to comply with both SLR as well as LCR regulations, but SLR requirement is being gradually brought down to facilitate a smooth transition to LCR of 100% by January 1, 2019. Presently, a total carve-out from the SLR is 11% of banks’ NDTL that is available for consideration for LCR (RBI, 2017).

**Leverage Ratio:** The leverage ratio is used as a supplement to risk-based capital ratios to constrain the build-up of excessive leverage. It is intended to maintain the resilience of the banking system by limiting a bank’s total exposure (both on-balance sheet and off-balance sheet) in relation to its equity. Highlighting the limitations of risk-based capital ratios, IMF (2014) argued that risk-weighted assets can erode in “good times” when measured risks are low. However, they are also subject to “gaming effects” where banks manage risk weights down in order to fatten their capital ratios. Leverage ratios are being monitored in Indian banks with effect from April 1, 2015. In view of testing for a minimum Tier I leverage ratio of 3% by the BCBS till 2017, the Reserve Bank has been monitoring individual banks against an indicative leverage ratio of 4.5%.

**Capital Conservation Buffer:** The primary objective of the capital conservation buffer (CCB) is to use a buffer of capital to achieve the broader macroprudential goal of protecting the banking sector from periods of excessive credit growth that have often been associated with the build-up of system wide risk. As part of Basel III implementation, CCB is being implemented since April 1, 2015, with full implementation (2.5% of risk weighted assets) taking place by March 31, 2019.

**Counter-cyclical Capital Buffer:** Counter-cyclical Capital Buffer (CCyB) can be considered as an extension of the capital conservation buffer. It consists entirely of Common Equity Tier (CET) - 1 capital and, if the minimum buffer requirements are breached, capital distribution constraints are imposed on the bank. Similar to CCB, the primary objective of the CCyB is to use a buffer of capital to achieve the broader macroprudential goal of protecting the banking sector from a build-up of systemic risk. Due to its counter-cyclical nature, the CCyB regime may help to lean against the build-up phase of the credit cycle. During the downturn phase, it may help to reduce the risk that the supply of credit will be constrained by regulatory capital requirements that could undermine the performance of the real economy and result in additional credit losses in the banking system (BIS, 2017). RBI released final guidelines for the CCyB in July 2014. While the framework for the CCyB was adopted, the activation of the CCyB would take place when circumstances warrant. The CCyB will increase gradually from 0 to 2.5% of the risk weighted assets of banks. The credit-to-GDP gap is the main indicator in the CCyB framework. It is being used in conjunction with GNPA growth. Other supplementary indicators being used are the incremental credit-deposit ratio, the industry outlook assessment index and the interest coverage ratio. The CCyB decision would normally be pre-announced with a lead time of four quarters. However, depending on the CCyB indicators, the banks may be advised by the Reserve Bank to build up requisite buffer in a shorter span of time (RBI, 2015).

**Managing Capital Inflows/Outflows:** Capital inflows are determined by a host of factors. Interest rate differentials between domestic and international markets is one of them. In India, debt creating inflows such as external commercial borrowings (ECBs) and non-resident Indian (NRI) deposits unlike equity flows, have been modulated, based on the overall cycle of net capital flows, through the use of both price-based measures (such as linking the interest rate to LIBOR) and administrative measures by stipulating end-use norms for ECB. While during periods of large capital inflows, some outflows relating to residents have been liberalized, during periods of moderate capital inflows, both NRI deposits and ECBs have been made more attractive (Verma and Prakash, 2011).

### 3.2 Macroprudential Measures Taken in India – Cross-section Dimension of Systemic Risk

**Intensive Supervision of Financial Conglomerates:** Since 2004, financial conglomerates have been subject to more intensive supervisory oversight. The supervisory process focuses on management of group-wide risks, intra-group transactions and corporate governance. Furthermore, in December 2010, the Financial Stability and Development Council (FSDC) was set up as an inter-regulatory forum with the Finance Minister as its Chairman. It deals with issues relating to financial stability, financial sector development, inter-regulatory coordination, financial inclusion and macroprudential supervision of the economy including the functioning of large financial conglomerates.

**Identifying and Regulating Domestically Systemically Important Banks:** The Reserve Bank issued the framework for identifying and regulating domestically systemically important banks (D-SIBs) in July 2014. The DSIBs are very significant from the macroprudential perspective as they witnessed amplification in their systemic risk score during the global financial crisis period (Verma, 2017). Depending on their systemic importance scores (based on size, interconnectedness, substitutability and complexity), the Reserve Bank put banks into four different buckets and they are required to have additional CET - 1 capital requirement ranging from 0.20% to 1.00% on full implementation from April 1, 2019, depending upon the bucket they are put into. The higher capital requirements applicable to D-SIBs is implementable from April 1, 2016 in a phased manner. So far three DSIBs-State Bank of India (3<sup>rd</sup> bucket, additional 0.30% additional CET-1 requirement as per cent of risk weighted assets, in addition to CCB), ICICI Bank (1<sup>st</sup> bucket, 0.10%), HDFC Bank (D-SIB surcharge applicable from April 1, 2018) have been identified.

**Limits on Inter-bank Liabilities:** Uncontrolled inter-bank liabilities (IBL) may have systemic implications, even if the individual counter-party banks are within the allocated exposure. Further, uncontrolled liability of a large bank may also have a domino effect. In view of this, in March 2017, in order to limit the concentration risk on the liability side of banks, the Reserve Bank put the cap on IBL of a bank at 200% of its net worth as on 31<sup>st</sup> March of the previous year. However, individual banks with the approval of their Boards of Directors may fix a lower limit for their IBL, keeping in view their business model. However, IBL outside India were excluded.

**Restricted Access to Un-collateralized Funding Market:** In order to ensure that the inter-bank market functions in a non-disruptive manner, access to the un-collateralized funding market is restricted to banks and primary dealers and there are caps on both lending as well as borrowing by these entities (Sinha, 2011).

**Limit on Cross Holding of Capital among Banks/Financial Institutions:** In February 2013, the Reserve Bank put 10% (of the investing bank's capital funds i.e., Tier I plus Tier II) limit on banks' investment in instruments issued by other banks and 5% (of equity capital) limit on acquiring fresh stake in a bank's equity share.

**Banks' Exposure to Mutual Funds:** In July 2011, the Reserve Bank observed that the liquid schemes of mutual funds were relying heavily on institutional investors such as commercial banks whose redemption requirements are likely to be large and simultaneous. Also, they are large lenders in the over-night markets and market repo, where banks were large borrowers. Mutual funds also invested heavily in certificates of deposit (CDs) of banks. Such circular flow of funds between banks and mutual funds could lead to systemic risk in times of stress. Thus, banks could face a large liquidity risk. In view of this, the Reserve Bank put a cap of 10% (of net worth) on banks' investment in liquid/short-term debt schemes of mutual funds with a maturity of less than one year.

**Single and Group Exposure Limits:** In order to align the exposure norms for Indian banks with the Basel Committee of Banking Supervision (BCBS) standards and to further diversify the banks' lending base, the Reserve Bank issued final guidelines on the large Exposure Framework in December 2016 which will be effective from April 1, 2019 (RBI, 2017). Currently, the exposure limit is 15% (of capital funds of the bank) in case of a single counter-party and 40% of capital funds in the case of a group counter-party. According to the revised Large Exposure Framework, banks' exposure to a single and group counter-party would normally not be more than 20% and 25%, respectively, of its available eligible capital base.

**Banks's Exposure to NBFCs:** According to the Reserve Bank guidelines, the exposure (both lending and investment, including off balance sheet exposures) of a bank to a single NBFC/NBFC-AFC (Asset Financing Companies) should not exceed 10%/15% respectively, of the bank's capital funds. Banks may, however, assume exposures on a single NBFC/NBFC-AFC up to 15%/20% respectively, of their capital funds provided the exposure in excess of 10%/15% respectively, is on account of funds on-lent by the NBFC/NBFC-AFC to the infrastructure sector.

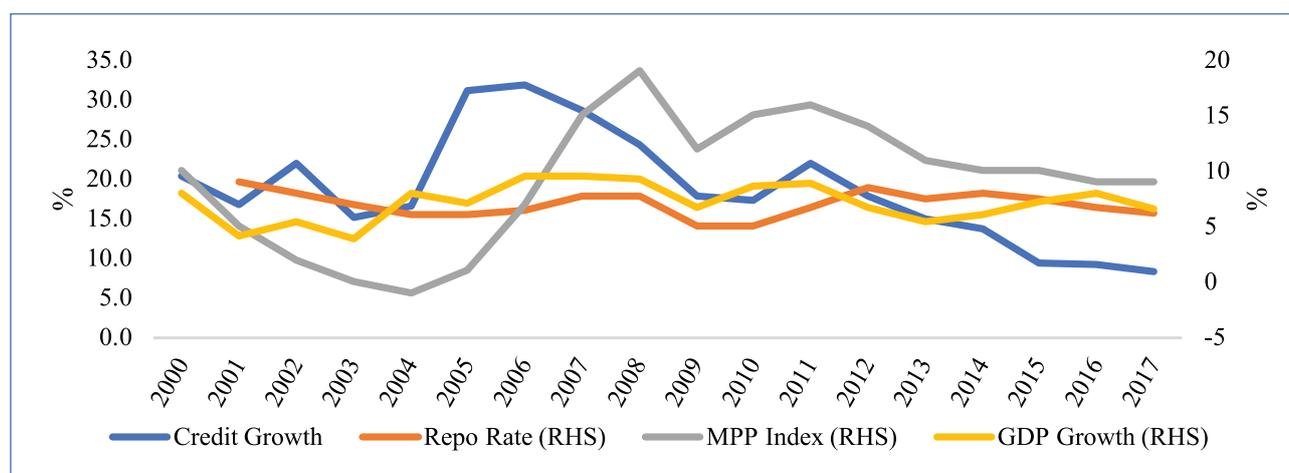
**Limits on Exposure to Sensitive Sectors:** Banks' exposures to the capital market (both fund based and non-fund based) are subject to a limit of 40% of their net worth. Further, their exposures to sensitive sectors such as the real estate, systemically important NBFCs and the commodity sector are closely monitored. Banks are also encouraged to place internal sectoral limits so as to ensure that their aggregate exposures are well dispersed (Sinha, 2011).

## 4. Effectiveness of Macroprudential Policies

### 4.1 Construction of Macroprudential Index

An aggregate macroprudential policy (MPP) index was constructed using risk weights and provisioning for standard assets for housing, CRE, consumer loans, capital market and CRR. The methodology for construction of MPP index is based on Akinci and Olmstead-Rumsey (2017). To derive the aggregate MPP index, firstly, individual indices for each of these macroprudential measures were constructed. Starting with zero (it can be any value) in the base year (here financial year 1999-2000 designated as 2000 in the Chart), a value of one was added if any macroprudential measure was introduced or tightened to contain credit or asset price growth. Similarly, a value of one was subtracted if the macroprudential measures were loosened. If the macroprudential measure was tightened or relaxed multiple times during the year, one was added or subtracted as many times. If no action was taken in a year, there was no change in the value of the index. Then, these individual indices were aggregated horizontally to construct the MPP index. Later, the aggregate MPP index was scaled up by 10, to remove negative values. The impact of macroprudential policies as indicated by the MPP index is visible on credit growth with a lag (Chart 8).

**Chart 8: Macroprudential Policy and Credit Growth**



Source: Reserve Bank of India except MPP index which has been calculated.

## 4.2 Panel-VAR

A panel vector auto-regression (VAR) model was constructed using credit growth, GDP growth and the MPP index following Love and Zicchino (2006) and Abrigo and Love (2016). It combines the traditional VAR technique, which treats all the variables in the model as endogenous, with the panel-data approach, which allows for unobserved individual heterogeneity. The first order VAR is given below:

$$z_{it} = \Gamma_0 + \Gamma_1 z_{it-1} + f_i + dc_{i,t} + e_{it}$$

where,  $z_t$  is a three-variable vector {totalcredit\_g, GDP\_growth, MPPindex}. totalcredit\_g is growth in total credit. In the regression, bank-groups were used as panels. To apply the VAR procedure in the panel data setting, one needs to impose the restriction that the underlying structure is the same for each cross-sectional unit. In order to overcome the restriction on parameters “individual heterogeneity” was brought in the model by introducing fixed effects, denoted by  $f_i$ . Since the fixed effects are correlated with the explanatory variables due to lags of the dependent variables, in place of mean-differencing procedure, forward mean-differencing was used to eliminate fixed effects. Given that it preserves the orthogonality between transformed variables and lagged explanatory variables, the latter can be used as instruments and the coefficients estimated by the generalized method of moments (GMM) (Love and Zicchino, 2006).

## 4.3 Database

The period for the study is 1999-00 to 2016-17 using annual data.<sup>3</sup> Bank groups were used as panels in the regression. There are four bank groups, namely, State Bank of India and associates, nationalized banks, private sector banks and foreign banks. Data pertaining to total credit was taken from the Basic Statistical Returns of Scheduled Commercial Banks in India published by the Reserve Bank of India. Data on GDP was taken from Reserve Bank of India’s Data Warehouse at <https://dbie.rbi.org.in>. The MPP index was prepared based on information on risk weights and provisioning on standard assets in various sectors and CRR as released by the Reserve Bank of India from time to time.

## 4.4 Results

On the basis of model selection criteria *ala* Andrews and Lu (2001), the first-order panel VAR was found to be the preferred model as this had the smallest MBIC, MAIC and MQIC. However, the coefficient of determination was found to be higher at higher lags. Based on the selection criteria, the first-order panel VAR model was selected using GMM estimation (Annex Table 1). Forecast-error variance decompositions which indicates the relative cumulative contribution of each of the variables to the overall behavior of the model suggested that the MPP index explains 3.1% of the variations in credit growth two periods ahead. It increases to 11.2% if the forecast horizon is 4 periods ahead (Annex Table 2). Furthermore, all the eigenvalues were found to lie inside the unit circle which confirms that the panel VAR estimates are stable (Annex Table 3).

The panel VAR results suggests that, on average, tightening of macroprudential measures as reflected in an increase in the MPP index affects credit growth negatively with a one-year lag. The result is significant at 1% level of significance. The result is in line with empirical literature. Although

3. Financial year is from 1<sup>st</sup> April to 31<sup>st</sup> March.

this result is for total credit, similar results were found for various sectors such as housing, CRE and consumer loans as the desired aim of the macroprudential policies is to contain overheating or sluggishness in the specific sectors. However, one unintended consequence of tightening of macroprudential policies is the decline in real GDP growth due to the decline in aggregate demand as evidenced from the results (Table 4). As macroprudential policies affect the availability and cost of credit by reallocation of spending over time by the agents, this in turn affects the aggregate demand (Shin, 2015). Kim and Mehrotra (2016) also found significant negative effect on real GDP from tighter macroprudential policies in case of four inflation targeting economies in the Asia-Pacific region. However, Boar et al. (2017) using a panel of 64 advanced and emerging market economies, found that the more active a country is in the use of macroprudential measures, the higher and less volatile is its per capita GDP growth. Thus, the effect of macroprudential policies on economic growth is influenced by economy's openness and financial development.

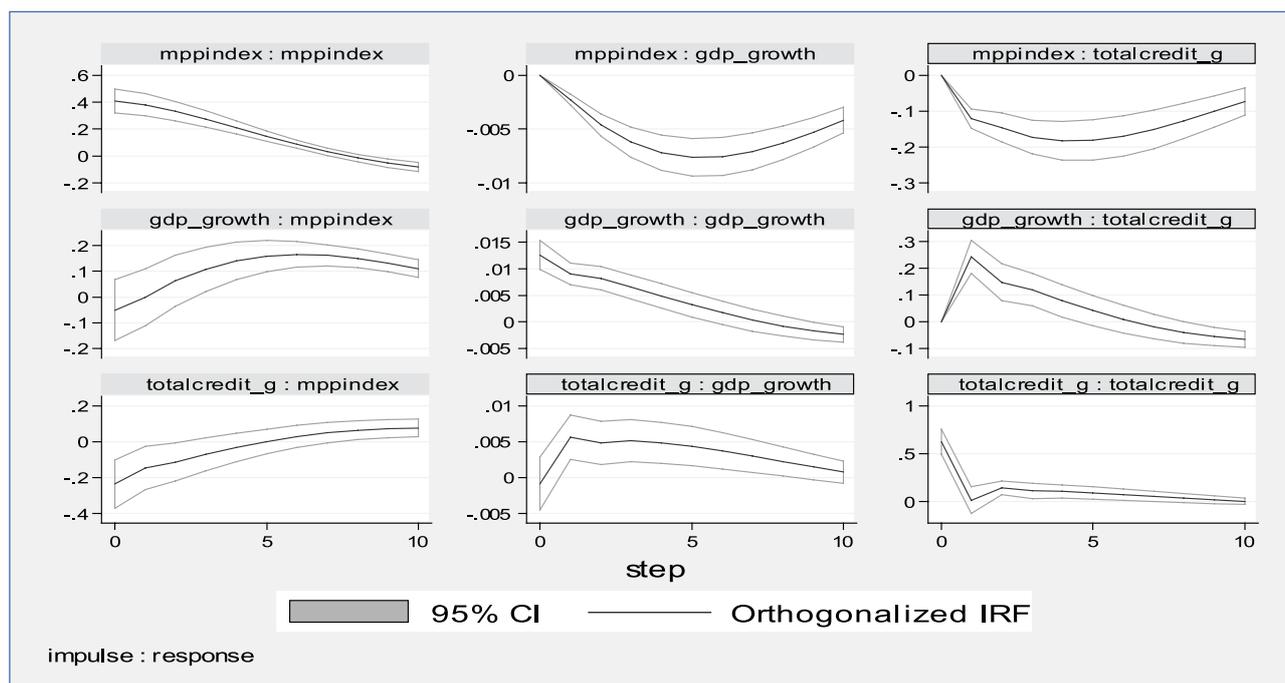
**Table 4: Impact of Macroprudential Policy  
(Three Variable Panel VAR)**

Response of	Response to		
	Total credit growth (t-1)	GDP growth(t-1)	Ln (MPP Index(t-1))
Total credit growth(t)	-.06315 (.096)	17.9757*** (.514)	-.2951*** (.009)
GDP growth(t)	.0078*** (.001)	.6952*** (.005)	-.0055*** (.001)
Ln(MPP Index(t))	.1235*** (.022)	3.7632*** (.109)	.9337*** (.004)
No. of obs.- 48			

Notes: (1) Figures in parentheses are standard errors.

(2) \*\*\*p<0.01; \*\*p<0.05; \*p<0.10.

The orthogonalized impulse-response function with the 5% error bands were generated by Monte Carlo simulation with 200 reps. The impulse response of growth in total credit to one standard deviation shock in the MPP index is negative for up to four periods. Similarly, the impulse response of GDP growth to one standard deviation shock in the MPP index was found to be negative for up to five periods (Chart 9).

**Chart 9: Impulse Response of Credit Growth to Macroprudential Shocks**

Note: Errors are 5% each side generated by Monte-Carlo simulation with 200 reps.

## 5. Findings and Conclusion

Emerging market economies including India have been very proactive in taking various macroprudential measures to restrain incipient systemic risk. Given that the Indian financial system is dominated by the banking sector, most of the macroprudential measures have been channelled through the banking sector. Among various macroprudential measures, risk weights and provisioning on standard assets in lending to sectors such as housing and CRE sector have been effective in restraining credit growth. At the aggregate level, macroprudential policies have also been effective in reducing excessive credit growth. One important feature of the macroprudential policies in India is that, for most of the time, it has been in sync with monetary policy as the implementing authority of both is the Reserve Bank of India. The effectiveness of macroprudential policies in the Indian financial sector suggests that they can provide an alternative tool other than monetary policy in dampening exuberance in credit cycles. However, the usage of macroprudential policies in various phases of the credit cycle indicates that their impact has been asymmetric. Macroprudential measures have been able to restrain credit growth in targeted sectors during periods of exuberant growth. However, their ability to uplift credit growth during downturns have been limited. Therefore, the limitations of macroprudential policies have to be kept in mind.

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**Annex Table 1: Criteria for Lag Order Selection**

Lag order criteria	Lag		
	1	2	2
CD	0.7506	0.9565	0.9615
J	46.5041	30.3495	23.1016
J (p value)	0.0112	0.0342	0.0060
MBIC	-58.0183	-39.3321	-11.7392
MAIC	-7.4959	-5.6505	5.1016
MQIC	-26.5884	-18.3789	-1.2626

**Annex Table 2: Credit Growth, GDP Growth and Macroprudential Policy Index: Variance Decomposition**

Forecast Horizon	Impulse Variable		
	Total credit growth	GDP growth	Ln (MPP Index)
<b>Panel A: Response on Total credit growth</b>			
2	0.84178	0.1268623	0.0313577
4	0.725107	0.1628106	0.1120824
6	0.6541469	0.1519534	0.1938997
8	0.6119484	0.1401395	0.2479122
10	0.5880006	0.1405099	0.2714895
<b>Panel B: Response on GDP growth</b>			
2	0.1163167	0.8654021	0.0182812
4	0.164893	0.7047409	0.1303661
6	0.1821221	0.5629759	0.2549019
8	0.1808865	0.4752417	0.3438718
10	0.1732479	0.4378148	0.3889372
<b>Panel B: Response on Ln (MPP Index)</b>			
2	0.197087	0.0067928	0.7961202
4	0.1554819	0.0301667	0.8143514
6	0.1326426	0.0877225	0.779635
8	0.1257253	0.1485774	0.7256972
10	0.1291469	0.1868909	0.6839622

**Annex Table 3: Eigenvalue Stability Condition**

Eigenvalue		
Real	Imaginary	Modulus
0.8859355	0.2050323	0.9093514
0.8859355	-0.2050323	0.9093514
-0.2061114	0	0.2061114

Note: All the eigenvalues lie inside the unit circle.