A Time Series Analysis of Interest Rate Movement in Credit Lending Channel with Reference to India's Monetary Policy Transmission Mechanism

THESIS

SUBMITTED TO

BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
(A CENTRAL UNIVERSITY)
LUCKNOW

BABASAHEB
BHIMRAO
AMBEDKAR
UNIVERSITY

LUCKNOW

प्रज्ञा शील करुणा
ESTABLISHED 1996

FOR THE AWARD OF DEGREE OF

Doctor of Philosophy

IN

ECONOMICS

Under the Supervision of
PROF. NMP VERMA

Submitted by
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Enrollment No. 216/15 **Year 2019**

DECLARATION

I declare that the thesis entitled **"A Time Series Analysis of Interest Rate Movement in Credit Lending Channel with Reference to India's Monetary Policy Transmission Mechanism"** submitted to Babasaheb Bhimrao Ambedkar University, (A Central University), Lucknow for the award of Doctor of Philosophy in Economics. It is my original work and it has not previously been produced for the award of any degree, diploma, fellowship or similar other titles anywhere.

This research study is carried out under the supervision of Prof. NMP Verma, Department of Economics, School for Ambedkar Studies (SAS), Babasaheb Bhimrao University, (A Central University), Lucknow, Uttar Pradesh, India. This is also declared that the thesis is essentially free from all kinds of plagiarism.

Deepanjali 18/04/2019

Place: Lucknow
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CERTIFICATE

This is to certify that the thesis titled **"A Time Series Analysis of Interest Rate Movement in Credit Lending Channel with Reference to India's Monetary Policy Transmission Mechanism"** submitted by **Ms. Deepanjali Das** is an original research work and has not been previously submitted in part or full for the award of any other degree or diploma to this or any other university.

The thesis submitted to Babasaheb Bhimrao Ambedkar University, Lucknow satisfies all the requirements as stipulated in the *Doctor of Philosophy (Ph.D.) regulations-1999* as amended in ~~2008/2010~~/2013 and it is fit for submission and evaluation for the award of the degree of Doctor of Philosophy of the University.

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ACKNOWLEDGEMENT

In gratitude to my mother, my father and the kind Universe

I reflect a deep sense of gratitude towards my supervisor who with munificence became my guardian, my personality developer and a philosopher; **Professor NMP Verma,** Department of Economics, BBA University, Lucknow. Sir has resolutely directed me out of my comfort zone and motivated me to confront my limitations with positive reinforcements. He is the very first person I am thankful to for helping me to carve a tenable research treatise out of an envisaged concept. I am grateful to him for his consistent effort in the whole trajectory of work throughout.

My sincere acknowledgement with undeniable words of appreciation and gratefulness to **Professor Sanatan Nayak**, Head of Department of Economics, BBA University, Lucknow for his concerted efforts to build a concrete research-related statistical knowledge. I am also beholden to the other faculty members **Dr. Devendra Kr. Yadav, Dr. Surendra Meher** and **Dr. LC Mallaiah, Dr. Pranav Anand** for their insightful advice and continuous support in myriad of ways.

Special thanks to my advisor **Professor Ashok Mittal**, Department of Economics, Aligarh Muslim University, Aligarh. I owe him his productive yet immersed time which he offered me and facilitated with his wealthy econometric knowledge. He also acted as an exemplary advisor and a role model.

I am grateful to **ICSSR, New Delhi** for its generous financial scaffold in the form of ICSSR Doctoral Fellowship. I am in their debt to acknowledge potential in my research study and relaying it further.

This note of gratitude may fall short of space if I begin counting blessings bestowed upon me by my family. Foremostly, I venerate Lord Jesus for his unconditional endowments over me and my family. I am deeply indebted towards my mother **Mrs. Ruby Das** whose mere presence is a fortress to me. She has instilled self-belief in me and so much more that it can't be crafted in standard lexical. I am beholden towards my father **Mr. AKD Das** for his forbearance with me and his effortful engineering of my outlook towards the work. I recognize him for my sincere and ingrained attitude towards research work. Thank You.

I can't thank enough my friends **Ms. Pratinidhi, Mr. Pawan Kumar Gupta, Mr. Altaf Ahmed, Mr. Firdaus Malik, Ms. Ruchi Bhalla, Ms. Pragya Sharma, Ms. Priti Jha, Ms. Vandana Ahirwar, Ms. Kanti Devi, Mr. Naved Ahmed Lone** and also my well wishers for their motivation amid the course of study. Certainly, my interesting venture in my journey of research is manifested because of their support and advices.

My sincere thanks to all the staff members of the department of Economics, **Mr. Atul Sahu** and **Mr. Sachin Srivastava** who have always been congenial with their assistance throughout the course with the related official formalities.

Ultimately, I am thankful to all those scholars, teachers, professors and non-academic personnel whose ideas has influenced me but have remained unintentionally unacknowledged.

Deepanjali 18/04/19

Date: 18/04/2019

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Place: Lucknow

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PREFACE

The study **"A Time Series Analysis of Interest Rate Movement in Credit Lending Channel with Reference to India's Monetary Policy Transmission Mechanism"** is integral in research of Macroeconomics. Monetary policy leverages the course of real economy making use of financial system of an economy to transform savings into investment. By means of Monetary Policy transmission mechanism; the analytical research attempts to measure the degree of success of RBI's monetary policy decision on the footing of Scheduled Commercial Bank's lending behavior in a monetary environment. The productiveness of monetary policy lies in the rapidity and extent of elasticity with which they achieve their final objectives. However, there is little consensus as to how the policy specifically exerts its influence. Also, there is an evolution in monetary policy framework of India's central bank since mid 1990's witnessing a deepening of financial system and sophistication of financial markets. This gradually directed a shift towards use of indirect instrument (policy interest rate and open market operations) rather than direct measures (like credit allocation) by the monetary authorities, evidencing a presence of not one single channel of monetary transmission. In that consequence, academic literature had undergone various studies to bring fore the workings of various so-called channels.

Being one of the Emerging market economies, it cannot be denied that India is known to be missing on a well functioning financial markets, an imperfect international capital market link and greater competition. Therefore, the transmission channel of India is characterized by long, variable and uncertain time lags. Apart from differential lags, there is also asymmetric involved in the quantitative responses of policy impulse to the goal variables in alternative phase of business cycle and liquidity condition. In this regard, the study aims to find evidence of an active bank lending and policy rate channel in India.

On the same front, the chapters are integrated accordingly with the aim to test and proof its significance in India's policy making. The following is the chapter plan:

Chapter 1: Introduction

Chapter 2: Theoretical and Conceptual Framework

LIST OF ABBREVIATIONS USED

ACF	Auto Correlation Function
ADF	Augmented-Dickey Fuller
AIC	Akaike Information Criteria
ARDL	Auto Regressive Distributed Lag Model
ARMA	Auto Regressive Moving Average
BPLR	Benchmark Prime Lending Rate
BIS	Bank of International Settlement
bps	basis points
BR	Base Rate
CBLO	Collateralized Borrowing and Lending Operations
CCIL	Clearing Corporation of India
CDs	Certificate of Deposits
CIBIL	Credit Information Bureau (India) Limited
CMR	Call Money Rate
CPs	Commercial Papers
CRR	Cash Reserve Ratio
CUSUM	Cumulative Sum
DBR	Department of Banking Regulation
DBS	Department of Banking Supervision
DGPs	Data Generating Process
ECM	Error Correction Model
ECT	Error Correction Term
EMEs	Emerging Market Economies
FDI	Foreign Direct Investment
FSB	Financial Stability Board
FR	Federal Reserve
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GNPAs	Gross Non-Performing Assets
G-Secs	Government Securities
H	High Powered Money
IMF	International Monetary Fund
KPSS	Kwiatkowski–Phillips–Schmidt–Shin

LAF	Liquidity Adjustment Facility
M	Money Multiplier
MCLR	Marginal Cost of Funds Based Lending Rates
MIBOR	Mumbai Inter-Bank Outright Rate
MP	Monetary Policy
MPC	Monetary Policy Committee
MPTMs	Monetary Policy Transmission Mechanism
MSF	Marginal Standing Facility
NCR	Narsimham Committee Report
NDTL	Net Demand and Time Liabilities
NH	Null Hypothesis
NIM	Net Interest Margin
NPAs	Non-Performing Assets
OLS	Ordinary Least Square
OTC	Over the Counter
PAC	Partial Autocorrelation
PACF	Partial Auto Correlation Function
PDs	Primary Dealers
PLR	Prime Lending Rates
PIs	Portfolio Investment
PSBs	Public Sector Banks
QTM	Quantity Theory of Money
RBI	Reserve Bank of India
REPO	RBI's Repurchase Rate
SACF	Sample Auto Correlation Function
SBCs	Schwarz Bayesian Criteria
SBI	State Bank of India
SCBs	Scheduled Commercial Banks
SLR	Statutory Liquidity Ratio
SVAR	Structural Vector Auto Regression
TB	Treasury Bills
TS	Time Series
US	United States
VAR	Vector Auto Regression
VECM	Vector Error Correction Model
WACMR	Weighted Average Call Money Rates

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Understanding the working of Monetary Policy is central to the study of Macroeconomics. Like fiscal authorities, central bank also affects development in the real economy by means of Monetary Policy transmission mechanism. Invariably, though in the short run, changes in monetary policy decision affect the rate of economic growth / inflation rate, (Taylor 1995. The monetary policy framework of India's central bank has been evolving since mid 1990's and a path of strengthened framework was laid out in the Patel Committee Report to RBI. A liquidity adjustment facility (LAF) was introduced in April 1990 as a main monetary policy instrument meant to operate in a deficit liquidity mode to ensure more effective monetary transaction. With deepening of financial system and sophistication of financial markets, most monetary authorities are using indirect instrument (policy interest rate and open market operations) rather than direct measures (like credit allocation). The efficacy of monetary policy lies in the speed and magnitude with which they achieve their final objectives. However, there is little consensus as to how the policy specifically exerts its influence. In that context, academic literature had undergone various studies to bring forth the workings of various so-called channels. The three main are interest rate channel, the asset price channel and the credit supply channel (Mishkin 1995, 1998, de Bondt 1998). Being one of the Emerging market economies, India is known to have the absence of well functioning financial markets, an imperfect link with private international capital markets, multiple bank ownership structure, limited capital account convertibility and greater competition. This leaves little scope for conventional interest rate channel, asset channel or the exchange rate channel. Hence, effectiveness and reliability of the monetary transmission depend on the properties of credit supply channel.

The money channel is the standard framework since Keynes and Hicks textbooks IS/LM models, based on the notion that the central bank use interest rates as a tool to manipulate aggregate demand by affecting the marginal cost of borrowing. Taylor (1995) gives a good account of this channel. He shows how contractionary monetary policy raises short-term nominal interest rates, and through the combination of sticky prices and rational expectations, results in higher real long-term interest rates, thus constraining demand, at least for a time. Besides this, policy also transmits via other

relative asset prices, such as exchange rate and real estate prices constituting asset price channels by altering the net worth of households and enterprises.

Studies by Bernanke and Blinder (1992), Kayshap and Stein (1995), (1997a, b), Peek and Rosengren (1995), de Bondt (1999), Favero et al. (1999) and Kishan and Opiela (2000) offered appealing explanation for the strength, timing and distributional effects of policy on an economy via bank credit lending channels. They provide evidence of bank lending channel in monetary policy transmission. The two versions of credit channel are borrower net worth channel (Bernanker and Gertler, 1995) which depends on the collaterals and the access the borrowers have to non-bank sources, i.e. financial markets. The other, the bank lending channel, is the responsiveness of bank loan supply to adjustments in the stance of monetary policy, assuming banks to be the only source of external finance and presence of credit market imperfections. The distinction that underlies is that the bank lending channel operates solely through bank loan supply shocks on manipulations of amount of reserves.

The 2007-10 financial US crises has vividly highlighted the importance of stability of banking sector and the role of banks as a potential source of friction in transmission mechanism. At the same time, the role of banks seems to differ from the traditional model of bank lending channel as a result of deregulation, financial innovation and intensive use of market funding sources, i.e. securitization market.

Monetary policy influence the course of real economy and a financial system of an economy is made of institutional arrangement designed to transform savings into investment determined by rules regarding designs of instruments and regulation on banks practices. The early finding of Friedman and Schwaartz (1963) states that monetary policy action is followed by movement in real output that may lasts for 2-3 years (Romer and Romer 1989, Bernanker and Blinder 1992, Christiano, Eichenbaum and Evans 1994a, b). The results are silent about the interim.

The transmission channel is a hybrid of interest rate and credit channel and named as policy rate channel. First there is policy induced change in money supply. Banks influence the conventional interest rate mechanism of monetary policy since with reduction in money supply, which may consist of deposit liabilities of banks, is one of the principal factors responsible for increase in interest rate. It is the policy rate which

is changed by monetary authority. This is primarily done with the objective to contract money supply in narrow sense but also liquidity in general. But the role of banks in monetary policy transmission mechanism is largely neglected by economic theory.

According to textbooks IS/LM models and Modigliani-Miller approach, the interest rate mechanism does not necessarily depend on what asset banks hold as the same response would occur regardless of the proportion of bank asset that are held as loans or securities, but only on changes in real interest rates. Similarly, the change of reserves requirement by working on interest rate manipulates aggregate demand by affecting the cost of borrowing. This implies that banks play a passive role, offering no special services on asset side except issuing deposits on liability side. In other words, borrowers and lenders substitute loans and bonds perfectly as if no adverse selection and moral hazards are present in financial market. This mechanism is incomplete as it focuses mainly on aggregate outcomes of monetary policy shocks and offers no distributional or cross sectional response to monetary policy shocks. (Hubbard 1994). Banks provide liquidity on demand to depositors through the current account and extend credit as well as liquidity to their borrowers through lines of credit (Kashyap, Rajan and Stein, 1999). Traditionally, banks hold capital as a buffer against insolvency, and they hold liquid assets to guard against unexpected withdrawals by depositors (Saidenberg and Straham, 1999).

In contrast to this, a number of studies examined an active bank lending channel on the basis of two issues. First being that there are categories of borrowers dependent only on banks for the financing explaining market imperfections. Other is that whether RBI is able to shift bank loan supply shock. It has been studied in India that whenever there has been a change in policy rate, it has been followed by corresponding change in deposit and lending rates with a time lag. It is also observed that different bank groups adjust their lending with varying time lags. But recently, as a result of deregulated environment, financial innovation, an increasing role of institutional investor and intensive use of market funding sources, India's traditional bank business model has undergone change. Thus, there is a need of empirical assessment.

SECTION 1

Aim of the Study

The transmission channel is characterized by long, variable and uncertain time lags, making it difficult to ascertain the precise effects of monetary policy actions on the economy. Apart from differential lags, there is also asymmetric involved in the quantitative responses of policy impulse to the goal variables in alternative phase of business cycle and liquidity condition. In this regard, this study aims to find evidence of an active bank lending channel in India. A bank mobilizes domestic savings and is a conduit of monetary policy transmission. Since capital outlays needs for most development projects are met majorly from these banks, they accelerates economic growth. With reforms, global integration and liberalization in India, granting banks operational autonomy, a well functioning credit market has added an unwelcome effect of debt accumulation. This has changed the predictable way a bank behaves according to the traditional bank lending channel rendering the monetary transmission mechanism unstable. This study inspires to acknowledge the systemic way a bank behaves to the intended moves of RBI and how far banks alter their assets and liabilities, adjusts their loans securities, deposit and non-deposits portfolio behavior to monetary policy stance, highlighting the precise role banks play in monetary policy transmission mechanism.

SECTION 2

Objectives of Research

- Test the pass-through from policy actions through money market's instrument to bank lending.
- Empirically substantiate the degree and speed of subsuming complete pass-through after the policy induced disequilibrium.
- Compare the effectiveness of India's monetary policy framework with respect to credit channel transmission in a pre and post new monetary policy regime.

SECTION 3

Null Hypothesis (H_0)

- There is a complete pass-through from policy changes to bank interest rates.
- There is no significant speed of adjustment after policy induced disequilibrium.
- There is no difference between India's monetary policy framework in terms of credit channel transmission in a pre and post new monetary policy regime.

SECTION 4

Overview of Literature

Focusing on the vast literature that tries to conceive and assess the mechanism of monetary policy and its effect on the real economy, the traditional money view was found incomplete as most empirical analysis on macro level data had been unsuccessful to show how a small change in interest rate could trigger such important responses.

Despite a centered note of account of bank role in affecting real economy, through the focus on required reserves in determining the volume of demand deposits, role of banks has received much less attention in monetary policy though it addresses an important implication in our understanding of monetary policy transmission mechanism.

In the study discourse of Cecchetii (1994, 1999) there are two systems predominating in performance of monetary policy transmission mechanism: monetary approach[1] and another credit–oriented technique[2]. Literature has posited host of economists who focused on investigating the operation of monetary transmission onto financial factors and the link between financial and real sector. Sukmama, Kassim (2008) and Tobias, Hyun (2010) audited the monetary policy impulses while encompassing a particular intermediate role of banking sector. The study carried similar notions to Cecchetti (1994, p:22) regarding unique features of geographical area which varies across

[1] Money View
[2] Credit view
[3] Propounded and propagated by Granger (1981, 1986), Hendry (1986), Pagan and Wickens (1989) and

countries with distinctiveness of degree of health of banking system and depth of financial markets.

The leaps of recent mutations "structural changes in the economy especially in credit markets and interaction between changes in monetary policy actions and manner of formations of expectations" (Mishkin, 2010) have created a gap erupting in the name of globalization. In this backdrop, efforts by economists in the league of effectively measuring the effectiveness of monetary policy have expanded their visions. Works of Papadamou and Kandil (2006), Mohanty, Mukherjee and Bhattacharya (2011) over emerging market economies found impaired institutional framework, low financial market depth and high cost of loans causing degree of development based obstructions in traditional channels. Moreover, the choice of monetary regime followed by a country is also tested as a relevant factor in monetary policy analysis. Mishkin, Schmidt-Hebbel (2006) and Krusen (2011) learned adoption of inflation targeting to be favorable in improving the macroeconomic performance.

A number of studies conducted, particularly to mention of Hubbard (1994), assessed if proponents of credit channel offer an intuitive explanation for the strength, timing and distributional effects of policy in the economy. This alternate view purported the impact of monetary policy forces not only on the demand for loans but also over the supply of loans. This manner of influence is referred to as bank lending channel where banks offer cross sectional and distributional response to monetary policy shocks. This bank lending channel stresses that financial intermediary decidedly has an active role in the monetary mechanism.

Kishan and Opeila (2000), in the study of the U.S. data of 1980-95, tested bank loan shift roles in transmission of monetary policy by considering differences in bank characteristics by way of segregating bank according to asset size and capital leverage ratio as a constraint of bank's ability to fund loans. In practice, the attempt to find bank lending channel separated banks by differential balance sheet characteristics (as an indicator of banks' ability to supply loans). They brought forward evidence that small undercapitalized banks may not be able to offset the loss reserves and are, therefore, more responsive to monetary policy for their lack of enough deposits to sell. They also proved association between stabilization policy and regulation policy

where a bank's capital is an indicator of the bank's health and prudential regulation prevents undue risks.

As noted by Pandit and Vashisht, (2005, 2006) in their research of "Monetary policy and credit demand in India and some emerging market economy", RBI uses short term rate like repo rate as an instrument believing it can send programmed signals to money and credit market. The paper estimated that alongside money market; credit, debt and stock markets are also expanding and deepening. The authors validated in favor of a different science of successful monetary policy in the current script for the correct assessment of market signals and noted it to be an essential requisite.

Gambacorta and Paolo (2003) studies a link between bank's risk attitude and level of capital displaying how such regulations has an influence on banks in their lending to monetary policy impingements. They found that bank capital impacts the credit behavior owing to three accounts: first being the market imperfection for bank equity owing to adverse selection problem (Bernanke and Blinder 1988, Stein 1998, Kishan and Opeila 2000), second is maturity mismatching between asset and liability where loans are largely long term and deposits short term, lest the lending can be renegotiated in respect to deposits. Here bank bears the risk due to maturity transformation performance that reduces capital and, hence, reduces profit (Thakor 1996, Belton and Van den Heuvel 2001a).

Furthermore, considering the importance of gyration in credit standards in explaining the loan or quantity dynamics in macroeconomics, Lown and Morgan (2006) in their paper "Credit effects in monetary mechanism" tried to take into account the impact of standards in the stance of monetary policy. They strived to test if the monetary policy works in part through lending standards or is independent to change in standard. Following this, a core macroeconomic VAR model was extended to include commercial loan market, looking for evidence for credit effects- both endogenous and exogenous using information on bank commercial credit standard as a proxy for bank credit availability, comprising four variables- log value of real GDP, GDP deflator, commodity prices and level of federal funds rate. The findings of the paper stated innovation and unanticipated shocks to impact commodity loans and quantity. Also, accounting for standards undermines the importance of federal fund rate shock on

quantity. A monetary policy tightening necessary to pacify an inflationary commodity shocks depend on whether credit standards are already tight, i.e. credit crunch.

Bolton and Freixas (2006) identify another more complex and difficult transmission channel operating through bank equity constraint as opposed to bank reserve constraint working not only through equilibrium composition of funding between direct and intermediated financing but also through bank incentive to raise equity capital. Due to asymmetric information and information dilution cost (Myer and Majluf, 1984), equity involves an endogenous cost. Hence, bank equity base is a key variable in determining the total amount of bank credit. But this also brings in the consequences of multiple equilibrium engendering from self-fulfilling market belief and hysteresis in market belief. This multiplicity gives rise to the tenet that there is large monetary policy affects when a change in monetary policy stance induces a shift from one equilibrium to another. Their model highlights the bank lending channel operating through bank equity capital market even when bank has perfect access to CDs or bond markets, allowing for coexistence of bank credit and securities market. From the corporate side of model, the two modes of financing is distinguished by their flexibilities- bank debt is easy to restructure while bank credit is in short supply, hence, have an endogenous costs and under the obligation of capital regulation. Here, monetary authorities' can no longer control bank lending by governing bank reserves and liquidity could not affect bank lending until capital adequacy remains binding.

Ismail and Said's (2007) paper on monetary policy effects on lending behavior in Malaysia, approached a model similar to Kashyap and Stein (1995) and Kashyap and Opeila (2000). The study took into account various bank specific factors like loans, capital and non bank deposits along with macroeconomic factors like GDP, money supply M3 and unemployment rate. They evidenced the presence of bank lending channel in case of Islamic banks in Malaysia and a change in interbank rate last year which affected supply of loan in the current year on the basis of bank balance sheet.

Khundrakpam (2011), in his study, identifies the nature and the agility of lag in transmission under equilibrium condition of demand and supply of credit at an aggregated level of all banks. His study acknowledges that in India the effective policy rate alters between repo rate and reverse repo rate depending on the level of liquidity conditions. Therefore, the author considers weighted call rate as the proxy

for policy rate. His model of supply of credit is a function of deposits, nominal interest rate on credit and monetary policy rate augmented with demand determining variable to controls for demand shocks. The aftermath of the study revealed a corresponding adjustment of credit portfolio to policy induced contraction or expansion of deposits with inflation and exchange rate appreciation having an adversarial impact on growth of bank credit with a long lag of nine months. More importantly from the point of monetary policy view, the transmission of policy rate to bank credit took seven months.

But the credit channel is not a distinct, free standing one. It is a set of factors that amplify the money channel through endogenous changes in external finance premium. It is the difference between funds raise externally (issuing equity and debt) and internally (retained earnings). The view, a change of monetary policy that raises or lowers OMOs, tends to change external finance premium in the same direction. Recent studies made on affect of monetary shock on external finance premium show greater impact on small firms than on large ones on the assumption that large firms have easier access to credit markets. Besides, Kashyap and Stein (1995, 2000) results revealed that larger banks are better able to neutralize monetary shocks on disaggregated bank data analysis on dividing banks into size categories. By extending the analysis to eyeing on panel data study by Peek and Rosengren (2013), the literature has obtained strong results focusing on the cross sectional relative differences in bank or bank characteristics to differences in the extent bank can insulate the loan portfolio from monetary policy stance. Banks also face capital requirement constraints in addition to the reserve requirement constraint and this bank capital, liquidity and its size determine the degree to which they access the external funds depending on which constraint is more binding.

Bhaduri and Goyal (2012) in their study used disaggregated data on individual banks using dynamic panel data model for India based on balance sheet strengths. They evidently reveal the existence of a bank lending channel in loan supply behavior and more emphatically on small banks, examining the implications of bank ownership. The reactions are influenced by the surplus and deficit liquidity conditions of banks. And since large banks claim the lion's share in lending in India, the policy

effectiveness is moderated. Hence, formation of even larger banks through M&A must be advocated with caution.

Further, in India, the government and RBI have tried using the banking sector to its vantage in terms of achieving equitable growth, all banks are demanded to disburse to 'priority sector' in India. Thus, the 'priority sector' is legislatively governed and hence banks have little choice in respect to this. An attempt to test it revealed a stronger BLC operating in non priority sector lending to the direct effect of tight monetary policy regime depending on the balance sheet strength which brings decrease in lending to non priority sector at a faster pace than the priority sector. Priority sector tends to dilute the bank lending channel (BLC).

SECTION 5

Significance of the Study/ Research Gaps

India as a monetary sector, captures well a scenario of highly reformative and volatile market in recent past decades notwithstanding the setback of 2007-09 crises. A thorough rummaging of the literature acknowledges that the economists neglected to take cognizance of the Indian monetary policy transmission mechanism which the country's economy witnessed. The study aims at foraying in the investigation of the above, employing financial money market as a formidable intermediary, in the course in an underlying monetary regime shift. Such research is considerably missing from the host of available literature hitherto largely limited to developed countries. The research will go a long way in better understanding and gauging of the working of monetary policy transmission mechanism catering through the traditional interest rate channel treading along with credit channel trickling down to the monetary sector.

SECTION 6

Contribution to Literature

The study of research holds authenticity in terms of objectives decided, economic model, the econometric modeling besides the elected period of study which entails the duration of Global economic crisis and hence an occasion of policy challenges. The time span is marked by widespread indeterminateness with which economic variables

behave doubly complicating the Indian environs faced with global macroeconomic changes, structural issues in domestic economy and inflation volatility (RBI, 2009). Albeit testifying the downturn, Indian central banks were among the few in the world to have been successful in insulating the domestic bank sector for the aftermaths of the GFC.

SECTION 7

Research Methodology

The design of the implicated research is framed in a closed economy where neither the out-of-country monetary stance has any effect over the home country nor the home country can leverage the rest of the world by its monetary actions. The fiscal policy is separate under the control of the government, thus given, to which monetary authorities have no major dominion. The RBI has a direct thruway to sway the monetary base by administering the bank rate, Cash Reserve Ratio, Statutory Liquidity Ratio, i.e. quantitative controls on credit creation capacity of commercial banks; resorting to Open Market Operations and Private Placements of Treasury Bills. Henceforth, they govern the quantity and inflation. The intention of the study is to deduce the reach of the interest rates which have been played out customarily as operating and intermediate target variables of the prevalent India's monetary policy transmission.

Retrospection of literature illuminates the models used lately in exploring credit lending channel of monetary policy transmission mechanism. Several economic study reads shed light over Vector Auto Regression (VAR) model propounded by Sims (1992) which provides structure to relationship of contemporaneous variables by ordering them and allowing the orthogonalised impulse response functions to better portray the true structural disturbances. The empirical approach embraced for this research probe comes as a natural progression of VAR model videlicet, cointegration[3] and error correction, to get around the problem of spurious regression consociated with non-stationary time series data. Cointegration furnishes and embody between short-run dynamics and long-run equilibrium. This thesis aims at estimating using the

[3] Propounded and propagated by Granger (1981, 1986), Hendry (1986), Pagan and Wickens (1989) and Mills (1991).

Autoregressive Distributed Lag (ARDL) approach to co-integrating testing rather than the single equation testing for co-integration based on Johansen residual based tests where also pre-testing is not required for the order of integration. The ARDL model used in the study uses the approach of F-statistics to test for joint hypothesis to ensure that all the coefficients of all lagged variables in the ECM equation are zero. Pesaran, Shin and Smith (2001) through five cases of ARDL approach to co-integration to lay down the results of ECM. The model intervenes autoregressive distributed models of orders (p, p,...p) models where the F-statistic has asymptotic critical value bounds for all the cases. If the computed F-statistic falls outside the critical value bounds, the test allows conclusive evidence without discerning about the integration situation of the underlying regressors. Whereas, if the F-statistic fall within the bounds inference, the test stands inconclusive and comprehension of the order of integration is required before advancing further. If F-statistic lies below the 0.05 lower bound, there is evidence of no level relationship. Hence, hypothesis of 'no level relationship' cannot be rejected at 5 percent level.

There are two ways in which this methodology would provide an upper hand to our analysis. One, the long-run liaison between cointegrating vector variables will appear cogently explicating short-run multifariousness. Two, the deliverance of error correction model elucidates facts about the system from which impulses begets, aiming for better long-run perspectives.

7.1 Data and Variables Selection

In the Indian context, the data on policy variables like, SLR, CRR, Bank Rate, Repo Rate, etc., financial market's weighted average call money market rates and commercial banks' credit and deposit rates are abstracted from Reserve bank of India's Annual Report, Weekly Statistical Supplements, Handbook of Statistics on Indian Economy and Occasional Papers. We chose monthly data ranging from 1985M1-2016M12. We know that as RBI takes plunge over some indirect instruments too whose effects are reflected in the operating target variables sooner or later. For any monetary stance exercised by RBI through open market operations or reserve base, the effect is immediately felt over call money rates through liquidity manipulations on the inside of commercial banking. Hence, we unify Weighted Average Call Money Rates in study of monetary policy transmission. Since Repo

auctions started from 2000, we consider and restrict our analysis including repo rates to the period 2001M1-2016M12. We delve into probing the impact of alternative policy variables on money market segment of financial market of India.

Ln prefixes is used for logarithms and Δ is prefixed along variables that are integrated to the first order. Models are improved through diagnostics tests and VAR's lag order selection criteria are selected for accurate lag order.

7.2 Empirical Model

Originally, the variables are arbitrated for their statistical properties, in specific, the stationarity of picked variables with conventionally competing unit root test available, Dickey Fuller test or Phillip-Perron test. We opted for Augmented- Dickey Fuller test which concluded that all variables concerned were I(1). This permits us to exploit the Bound cointegration test and with the formal use of causal analysis, a meaningful ARDL model is framed to evaluate the effectiveness of the credit lending channel of monetary policy transmission in the post-liberalized Indian economy.

SECTION 8

Outline of the Thesis

The Second Chapter titled **"Theoretical and Conceptual Framework"** begins with the various theories that nurture the seedbed from where the idea germinated. The chapter then moves to give an overview in order to flash the underpinning of the consortium over the time of monetary policy with various institutions in the form of monetary policy channels. Moreover, it also encompasses the monetary policy framework with an exclusive explanation on the pivotal congress financial market shares with the monetary policies in integral background of the monetary regime shifts. The chapter exposes the evolution in the way monetary policy conducts and the significant role bank and money market holds.

The Third Chapter, **"Testing the Degree of Association among Policy Rates and Financial Market Rates"** is premised on the understanding that a Time Series analysis sufficiently accommodates only a limited number of variables in a particular model. A narrowing down of the variables is of central importance to deliver a good statistical model. Thus, this chapter tries to bring justification of the selected monetary variables clubbed to test the effectiveness of monetary policy mechanism in India.

Therefore, through statistical tools of correlation and regression, we elect the most convincing factors logically structured and shown in the same.

The Fourth Chapter as its title depicts, "**Empirical Evidence of Monetary Policy Transmission from Policy Rates to WACMR in the Pre-New Monetary Policy Regime**", conforms to the consequential part in addressing the first half of the pass-through towards returning from policy rate innovation back to equilibrium position. The Chapter, with segregation of the time period, also endeavors to find the direction and standing of the pass through in two different regimes witnessed by India. Judgment on the footing of elasticity level and the speed of put-reach in time months is used as a stratum of discernment.

The Fifth Chapter envisions the "**Empirical Evidence of Monetary Policy Transmission from Policy Rates to WACMR: Post-New Monetary Policy Regime"** and is an extension inclined to the fulfillment of the comparative analysis against the backing of recent shift in the monetary regime. With the same operational procedure in chapter four, this chapter aims to find the impetus to reach back to balance after a policy induced disequilibrium. It is found that there has been a positive leap post the shift in the indirect instruments based regime by RBI substantiating the improvement in health of India' MPTMs.

The Sixth Chapter "**Last Leg of Credit Lending Channel: Monetary Transmission to the Bank Interest Rates"** caps off the last node of India's policy rate channel in a monetary environment and aims to postulate the type of relation the bank behavior partakes in the channel. There is a resultant short run relationship discovered of the credit lending behavior of SCBs to the policy signaling. This comes true after the transposing from a quantity based to price based channel since the launch of new and short term instrument based monetary operation.

This research study's Seventh and the last Chapter "**Conclusion and Suggestions**" summarizes the results alluding to the empirical analysis and concludes with the policy discussions based on the derived inferences. It gives an outline of the important detections with some specific suggestions. It is expected that a new door of possible and hitherto unexplored research vistas will take ground and that this will transpire into further investigations of the concerned problem.

CHAPTER 2

THEORETICAL AND CONCEPTUAL FRAMEWORK

INTRODUCTION

The relevance of monetary policy gained traction since 1970s when reporting of the snowballing budget deficit created doubt over the productiveness of fiscal policy. Greater attention turned towards the fashion with which monetary policy exacts its acquirement of the desired objectives of financial stability and economic growth. Formally, Reserve Bank of India plies over the monetary base and/or reserves from the banking system when it exercises its control over the economy. And, how these interest rate fluctuations and reserve requirements manipulations reach the intended goals hinges on the implicit monetary transmission mechanism of a country. **Monetary policy Transmission Mechanism** is the course, through which, the activities of central bank is transmitted to the end-objectives of stable inflation and growth via fine-tuning the variables, directly or indirectly associated with commercial banks, by changing reserve requirements or interest rates, on an overnight basis.

Plan of the Work

The present chapter endeavors to uphold the scope of the study. We begin with the introduction to four major channels of Monetary Policy in Section I. This occupies important mention for a brief background in substantiation of the chose channel. Section II contributes to an acknowledgment of the New Paradigm shift in Monetary Economy since the launch of Economic reforms. This further provided substance in the next section that embodies the constitution of monetary policy framework shifts. The next section implants the validation for the choice of monetary policy variable and interest rate. Section V gives arguments regarding the scope and the outlook of the research in context of Taylor's Monetary Policy Rules. Finally, literature of method and technique chosen for the empirical study is corroborated and discussed in Section VI.

SECTION 1

Monetary Theories

1.1 Classical Theory

The classical model happens to be the standard microeconomic theory quite popular till the early 1930s. The supporters advocated neutrality of money where price adjusts

quickly to equilibrate demand and supply. With the assumption of general equilibrium prevalence in all the market, money was relegated to just a medium of exchange and a factor that serves only the overall price level without any effect on the real variables.

Money treated as neutral propagated that doubling the money supply would proportionally double the price level with no impact of output. This also inferred a direct relation between money supply and inflation while an indirect one with real income. A situation when money supply expands higher than the expansion of real income creates inflationary condition.

They propounded the real factors like the capital, labor, technology and the like which decides equilibrium output. It focused on the supply in the sense that economy yields with full employment. Further the theory calls the money to be a non-financial asset and thus non-interest earning.

Even contemporary Neoclassicals pronounce a dormant role of money in the output standing. Both classical and Modern Neoclassicals devote minimum role of the monetary policy in output determination and even if central bank administer control through change in money supply, inflation is resolved from demand for money. The theory highly languished with the catapulting of Great Depression in 1930s.

1.2 Keynesian Monetary Theory

With the advent of the famous book "The General Theory of Employment, Interest and Money" the classical theory sinked and called for the rejection of the basic classical assumptions. Keynes assumed an inefficient allocation of resources, persistent unemployment and market of no full employment. All pervasive market equilibrium was rejected. He was also the founder of Business Cycle Theory.

Keynesian monetary economics centers on the idea of liquidity Preference Theory (interest sensitive money demand) where money is chosen over other financial assets in the events of low interest rates. Transaction demand and Speculative demand motives of people were the reasons why people demanded money when the speculative demand part of demand for money comes to be a function of interest rate. Interest rate is valued as a monetary term in Keynesian frame of reference; it is the

reward of parting away with liquidity. With this, monetary policy was regarded to be playing a kinetic role in controlling effective demand suggesting non-neutrality of money.

Keynes theory highlights the interest rate channel of monetary policy transmission when an increase in money supply lowers the interest rate which leads to high investment (interest elastic) and high aggregate demand and thus high output, given the less than full employment supposition. In a less than full employment economy condition, money supply impacts the real sector positively.

The modern Keynesian economics, unlike Keynes, believed money to be determined endogenously falsifying the notion about money supply being treated as a target variable in monetary policy transmission mechanism. Instead interest rates were set by central banks in close operation to the revered Taylor rule. However, Keynes theory was also denounced on various fronts. The prolonged low interest rate proved ineffective and led to financial crisis leading to stagflation and periods of deflation. Such events changed the views about interest rate channel as a weak transmission mechanism of monetary policy.

1.3 Monetarists

The monetarists took off in favor of resurgence of the segments of Classical Theory and vaulted against the Keynes Theory. In the second half of twentieth century, Freidman (1967) argues the ineffectiveness of monetary policy in the long run re-escalating money supply growth rate as the economic growth's target variable and postulated its efficaciousness only limited to nominal variables in the short run.

Highlighting the Phillips curve, monetarist took note of the term flagged by Friedman "natural rate of unemployment" later on referred to as "non-accelerating inflation rate of unemployment" or NAIRU and argued upon the different inflation and unemployment relationship in the long-run. For the period 1961-69, there was a negative relation between inflation and unemployment and only a positive inflation would make possible a reduced state of unemployment. The monetarists asserted that the relation is a function of time and alleged the impossibility of a trade-off beyond NAIRU.

Friedman (2003) based the Monetarist theory on the Neoclassical Quantity equation. They explained that rate of change in general price level is equal to growth rate of money supply less the real output growth rate keeping the velocity of circulation constant. According to them, there is a positive relation between money supply and price level and where inflation is always a monetary concept. In order to control inflation, money supply needs targeting.

Their theories faced criticism on the grounds of explaining money supply being solely done by central bank determined exogenous variable when in practice a central bank follows interest rate rule which makes it an endogenous variable (Romer, 2006). Any adjustments to money supply are made only to keep interest rate within the target level.

1.4 Rational Expectation and New Classical Theory

The backers of Rational Expectation Theory share their idea with Neoclassical and Monetarists. They aspire for the notion that economic agents learn from their past mistakes and do not repeat them. It lays microeconomic bedrock to a macroeconomic association. Policy ineffectiveness proposition was heralded by Lucas (1987) who, in the absence of systematic errors, contended and predicted that the monetary policy cannot have desired effect and there has to be an element of price surprise for the policy to be effective.

1.5 Post Keynesian Monetary Theory

This theory propounds an active role of money that impressively impacts short-run and long-run nominal variables in the interaction between demand and supply of economic agents. The endogeneity nature of money is the chief feature of the Post Keynesian Monetary Theory. The economists of such school purported the interest rate setting monetary policy and argued that financial stability along with inflation targeting as the objective of monetary policy. It is sketched in the form of two divisible groups: Accommodationists and Structuralists.

Accommodationists count on the monetary authority harboring fully the demand for money from banks and public on the underpinning of interest rate elasticity.

Structuralists share the same idea but also in addition to the structural characteristics of banks and central banks left out in the above theory. As the central bank can only influence the money supply by changing the interest rates rather than directly, it has boundaries regarding exercising its function of lender of last resort. Barring above, commercial banks also diversify their portfolio, due to which they are not able to shelter the demand for credit from a single borrower. Also, there is lack of certainty about liquidity preferences of the non-banking public.

SECTION 2

Channels of Monetary Policy Transmission: An Overview

Alluding to the late literatures underscores that monetary authorities have encountered some unexpected and untimely consequences in its objective outreach. As described by **Peter Ireland (2005)** in his thoughtful paper, Monetary Policy delineates how policy induced changes in nominal money stock; M2 or short term nominal interest rate impacts real variables. He points out a key assumption of an indispensable presence of monetary policy actions in the economy. When a central bank changes the monetary base, and if it has an influence past the instantaneous effect on commercial banks on a different scale, this impresses that while some financial market agents taste ineptitude to cancel out the effect, others adjust by changing some segments of their own liability. This suggests that there is more than the conventional channel of policy transmission. Moreover, nominal prices lack an immediate response to those shifts to an extent that leaves the real values of monetary base unchanged. There are no perfect privately issued instruments to substitute the shocks perfectly and counterpoise perfectly the tinkered monetary base. Such uncertainty begets researchers to gauge correctly the degree of monetary policies efficaciousness with which policy makers could be able to veraciously assess the timing and effect of policies, thus understanding the economy's monetary transmission mechanism. This vagueness about Monetary Policy mechanism is mounted with the acceptance of notion that there is no single way that traverses to bring control over the working of the real economy. Time immemorial has gifted us with the discovery of various theories in our riches to better understand the monetary policy operation. This calls for their distinct mentioning.

The nascent economic era in the early 1990s treated the interest rate channel as a mainstay of teaching in macroeconomics. **Mishkin (1995)** better emphasized a standard feature by Keynes postulating the monetary transmission operation through business and consumptions decisions in investment spending accredited as ***Interest Rate channel***[4]**. Hicks (1937), Lucas (1972)** and **Fischer (1977)** believed the conspicuous place traditional Keynesian textbook IS-LM model held.

$$M \downarrow \Rightarrow i \uparrow \Rightarrow I \downarrow \Rightarrow Y \downarrow \text{ (Interest rate channel)}$$

The second major channel is the ***Exchange rate channel*** where monetary policy transmission affects net exports. It gained popularity with growing internationalization and commencement of flexible exchange rate.

$$M \downarrow \Rightarrow i \uparrow \Rightarrow E \uparrow \Rightarrow NX \downarrow \Rightarrow Y \downarrow \text{ (Exchange rate channel)}$$

The third consequential channel focused by **Metzler (1995)** is the ***Asset Price channel*** whose supporters objected the Keynesian's only one relative asset price for analyzing monetary policy impacts. In remonstrance, the Taylor variant campaigned about two relative assets; one interest rate and another; exchange rate. Monetarists encouraged the monetary policy paradigm in a universe that changes in every business cycle. The objecting monetarist focused on relative asset prices and real wealth premised in ***Tobin's q theory of investment (1969)*** and ***Modigliani Life-cycle model (1963)***. Tobin's model brings a channel of monetary policy transmission through an effect on the valuation of equity.

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow q \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow \text{ (Tobin's asset price channel)}$$

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{wealth} \downarrow \Rightarrow \text{consumption} \downarrow \Rightarrow Y \downarrow \text{ (Ando – Modigliani asset price channel)}$$

The fourth significant channel is the ***Credit channel***. It was pioneered by **Bernanke and Blinder (1988)** in his paper "Credit, money and Aggregate Demand". Reckoning the standard books of aggregate demand, such as IS/LM model, that treats bank asset and bank liabilities asymmetrically/fairly analogous to traditional money view. As posited in the textbooks IS/LM models and Modigliani-Miller approach, interest rate

[4] Mohanty (2010)

mechanism does not necessarily depend on what asset banks hold, seizing the same response regardless of the proportion of bank asset held as loans or securities, the only changes are brought about by real interest rates. This implied a passive role played by banks, offering no special services on asset side except issuing deposits on liability side. A special importance was given to liability side of bank's balance sheet in the role of determination of aggregate demand, where bank loans are lumped together with other debt instruments in the 'bond market'. In the traditional textbook version of Monetary Policy, banks assumed to hold a single catch-all asset called bond. But banks operations affirm that liquidity of bond is pre-negotiated loan as they are not prefect substitutes. Amidst resource crunch, bank strives surpassing it either by selling securities or by taking recourse to non-deposits resources like Certificate of Deposits. This denies any such bank role played in determining the real economy as also maintained by **Romer and Romer (1990)** prompting rich array of questions which created new interest in credit-GNP relationship.

2.1 Credit Lending Channel: A Detailed Literature Review

The seedbed of the credit lending channel was laid by ***Ben Bernanke in 1986*** Carnegie – Rochester Conference Series on Public Policy. Proponing how alteration of real reserves on the part of central bank, alters the ability of credit creation of commercial banks, he advocated the spat over the existential model of process. Banks uses reserves which are held against transaction deposits and when the reserves with banks declines, transaction deposits falls and so brings an increase in nominal interest rates. The standard IS-LM model would show a resulted rise in real interest rate as well; depressing aggregate demand and output and economic activity. This follows the money view. It rides on two necessary conditions firstly, Banks cannot shield transactions balance form policy induced changes and secondly, Transmission of economy has no close substitute for money.

Christiano and Eichebaum (1992) study noted the money channel of monetary policy transmission mechanism work through the liability side of banks' balance-sheet. As in the words of **Mankiw (1985), Ball and Romer (1990), Grossman and Weiss (1983) and Rotemberg (1984)** price rigidities and limited participation in financial market have ratified the actuality of credit view distinguished from money view. Credits view starts at the rejection of the above conditions and studying

transmission after indulging asset market. **Tobin (1970), Brunner and Meltzer (1972) and Bernanke and Blinder (1988)** mushroomed the extended IS-LM model literature on information asymmetry, internal and external funds, imperfect monitoring (Bernake and Gertler 1989) special access to monitoring technology (Daimond 1984). **Ramey (1993)** as well as **Bernanke and Gertler (1995)** both contested the efficacy of interest rate channel and abetted this bank loan channel supplemented the usual money channel.

Bernanke and Blinder (1988) brought two conditions for credit view:

- Banks lack faculty to safeguard the loan portfolio from changing due to monetary policy.
- Borrowers are bank dependent and cannot fully insulate their spending from the availability of bank credit.

Thus, this channel turns out to be an important part that propagates both monetary and real shocks even if RBI cannot directly administer the bank credit. Motley of literature deduced manifold interesting results under various studies. **Kashyap and Stein (1994)** delineate its source eminently to **Roosa (1951), Blinder and Stiglitz (1983)** and **Bernanker and Blinder (1988)** extension of IS-LM model. **Stephen King (1986)** and later, in **Romer and Romer (1990)** tested for the extreme views of only credit or only money view, in two separate sets of equation of monetary aggregates and bank loans, respectively. The result deduced that bank loans are more coterminous with output while money leads much like **Bernanke and Blinder (1992)** and **Gertler and Gilchrist (1992)** where M1 or M2 decline immediately by bank loans are slow to fall but this does it deny it completely.

After the reconstruction of the standard IS/LM model with bank loans as another asset, a noted increase in the number of studies was found, highlighting the role of credit crunch in financial crisis and depression **(Bernanke, 1983, Bernanke and Lown, 1992).** This struck a chord that there is a linkage between central bank policy actions and commercial bank response within the broad confines of credit channel of MP. That is to say, commercial banks decision to cut down credit lending is capable of depressing economic activity **(Hein and Mercado-Mendez, 1992).** The revival of interest in the role of banks alludes to the major developments in literature on

microeconomics stranded the simple graphical representation of IS/LM model incomplete. This was pulled off through recent progressions brought in light in several models of aggregate demand allowing both the roles for money as well as for 'credit'.

The extended model involves three assets: loans, money and bonds. Considering a simplified balance sheet with assets: reserves, R; bonds, B; loans, L; and liabilities: deposits, D and assuming both borrowers and lender choosing between bonds and loans in consonance to respective interest rate; $L^d = L(i, p, y)$ where i and p being interest on bonds and loans and y being GNP for determining transaction demand for money.

One such model is of **Bernanke and Papadamos (1980),** where special mention is of the three financial assets demand deposits (DD), time deposits (TD) and bank loans (L) and another such is **Brunner and Metzler (1993)** model where he considered three financial assets; government debt, bank loans and instead of loan rate, they preferred nominal price of real capital. Hence, whole model is reduced in terms of a single interest rate.

In the extended model, there is an interaction of CC curve and LM curve, where CC curve is negatively sloped like IS curve and is shifted by monetary policy as well as by credit shocks that either effect loan or bond functions which is unlike the case of IS curve.[5]

Here, 'mu' is the problem of banking sector to allocate investible surplus (1-mu)M amount of bonds (B_b) and bank loans (L) where $B_b + L = (1\text{-mu})M$. Second, money and deposits becomes are synonymous and thus, equality between money and credit ceases.

Equilibrium conditions in Two Asset model[6] :

Equilibrium in Commodity market->

IS : $I(i, r) = S(Y)$ …… (Eq 1)

[5] The CC curve will reduce to IS curve if loans and bonds are assumed to be prefect substitutes by either borrowers or lenders and commodity market is insensitive to loan rate. The credit only view arises when money and bond are perfect substitutes.

[6] Bernanke and Blinder (1992) and Bernanke and Gertler (1995)

Equilibrium in the Money Market->

LM : M(i,Y) = M …….. (Eq 2)

Equilibrium in the loan market->

(LL): L (r, i, Y) = mu (i, r) (1-mu) M ...…… (Eq 3)

Now to reduce Eq 1 and 2 in a single equation, **Bernanke and Blinder (1988)** substituted the expression r = r(i,, Y, M) with r_i , r_y >0 and r_m <0 in eq 1, yielding a negatively sloped locus (CC) where both the commodity market and loan market are in equilibrium.

This model by Bernanke and Blinder effectuate with conventional shocks in the same way as IS/LM model, where an expenditure shocks shifts CC curve along the fixed LM curve and money demand shocks shift LM curve along the fixed CC curve likewise. But the only worth mentioning difference is that the rise in bank reserve will conceivably raise the rate of interest in the credit model, shifting both the curves outward. Economically, the credit channel makes monetary policy more uptick than in IS/LM model and therefore hike the transactions demand for money by more than the customary model. This model generates greater interest to the issues which IS/LM model avoids. Though it may show difficulty in pinpointing major shocks to credit demand, but shocks to credit supply is easy to put one's fingers for instance as exemplified in the **Great Depression (1930);** where there was downward shock to credit supply proliferating from increased riskiness in the face of liquidity crunch. The model stated act in reducing credit, GNP and interest rates on government bonds whilst stacking up interest rates on loans.

Bernanke and Blinder (1992) subsuming both the loans and bonds as assets of banks, noticed a repositioning in the assortment of depository institutions after a shock introduced in federal funds rate. The nudge bring deposits to diminish immediately but on the asset side, only securities decline first and it took almost six months for the loans to fall contemporaneous to the time output fall. This behavior endorses the existence of condition of credit lending channel.

Gertler and Glichrist (1991, 1992) paper studied small and large firm and attest compelling evidence in validation of supposition that there are credit market imperfections and their fate is significant during monetary contraction. Moreover, the

above argument is also sufficed by **Kashyap, Stein and Wilcox (1993)** who strived to examine the movement in the mix of bank loans and its close substitute, i.e., commercial paper for bank financing post monetary tightening. This empirical narration corroborates the reason behind the late perpetuation of credit channel in monetary policy transmission mechanism. **Oliner and Rudebusch (1995)** patronized and amplify the strength of credit lending channel by noting how real effect of interest rate is dilated further in presence of the credit view.

This expedited the review in the right account, to surface the rationale of the working of the concerned channel in context of reviving theories and entail the relevance of financial system in the monetary transmission mechanism. Earlier pool of literature ignores the role of credit market imperfections predominant in a continuously reformative country like India. Following this CC-LM curve, after the introduction of bank credit, aggregate spending also depends on loan market conditions. Hence, an expansionary policy will not only shift the LM curve but also the CC curve, such that while in the context of output rise, interest rate may go either way or remain constant. Any rise in money supply will lower the interest rate in the IS-LM case because of additional demand for bonds but in CC case because of existence of an additional asset viz. bank loan, additional money may go any way. According to **Partha Ray (2008),** comparative static derivatives show that while dY/dM is positive, the signs of dr/dM and di/dM may go either way. The condition for money to have greater effect over output when credit channel is operative is when $(L_y/L) < (M_y/M)$.

2.2 Special Nature of Bank Loans and Its Impact on Loans

The credit view based on informational imperfections of financial market attends to the additional effects on the investment and economic activity. This means that interest rate alone may be an insufficient indicator for the effects of monetary policy and further depends on the structure of financial system undergoing changes. Banks are different from other commercial firms in that they produce financial services, the reward to which is an interest rate, and most of their operations are financed by borrowings, the cost of which is also an interest rate. Banks are therefore more sensitive to interest rate fluctuations (in its effect on bank profits) than most other businesses. This implies that monetary policy impacts economic agents asymmetrically, depending on the way they suffer under relevant financial market

imperfections. Further, the rapid reformation of banking sector in India is the success factor in the transition from a centrally planned economy to open market economy under the growing confidence of domestic and foreign investors. This brings us to another sub channel of Credit Channel.

2.3 Bank Capital Channel

The level of bank capital also influences the bank price setting behavior as it fortifies banks to insulate themselves against unexpected credit risks (**Saunders and Schumacher, 2000).** But every bank is disparate in their capital position. It is based on three hypotheses. First, there is an imperfect market for bank equity under the presence of agency costs and tax disadvantages **(Myers and Majluf, 1984; Cornett and Tehranian, 1994; Calomiris and Hubbard, 1995; Stein, 1998).** Second, banks are subject to interest rate risk. After increase of market interest rate, a lower fraction of loans can be renegotiated with respect to deposits under the notion being loans mainly being long-term while deposit being short-term.[7]

Next is the regulatory capital limiting the supply of credit **(Thakor; 1996, Van Den Heuvel; 2001a, 2001b).** As per the Basel Accord's capital requirement, banks of India are to follow the Basel III requirements to be effective from January 2013. The guidelines demand banks to keep up a Minimum Total Capital (MTC) of 9% against 8% of total risk weighted assets (RWA) as laid down by the Basel Committee. Out of the MTC, at least 5.5% of RWAs must be affixed to Common Equity Tier I (CET1) and 2.5% of RWAs set for Capital Conservation Buffer (CCB). This was aimed to strengthen balance sheets of banks subject to the worst financial crisis of 2008 the world encountered.

Likewise on the other front, holding of equity capital are considered expensive than funding through debt owing to reasons of tax and dilution of control. On monetary tightening in existence, lending fails to comply with the regulatory capital requirement and amplify interest rate spread. This determines an increase in interest

[7] With regard to risk aversion (proxied by the capital adequacy ratio), the findings are also mixed: Saunders and Schumacher (2000) and Brook and Rojas (2000) found that the capital adequacy ratio has a positive and significant impact on banks' spreads, confirming the assumption that banks ask for higher margins to compensate for better tax treatment of debt over equity.

rate on loans and fall in interest rate on deposit on maturity transformation. It has been noticed that banks endogenously keep equity holding greater than market discipline and in turn operate in higher interest rate spreads. Hence, act as a credible signal of creditworthiness on the part of banks.

Moreover, there is a possibility that some loans would not be fully paid back, reflected in the standard measures of business cycle, termed as credit risk. Most of the papers on the determinants of interest margins show that credit risk–proxied by nonperforming loans (NPLs) to total assets and loan loss provision to total assets– exert a positive effect on interest margins **(Maudos and Fernandez de Guevara 2004; Angzabo 1997; and Maudos and Solis 2009, among others)**, which means that banks charge additional risk premiums to compensate for credit risk. Therefore, it is the aggregate credit risk which will determine the conditions of lending and hence the reaction of banks to market policy.

SECTION 3

New Paradigm for Monetary Economics

The basis of the above considerations can be sought in the term "new paradigm for monetary economics" advocated by **Stiglitz and Greenwald (2003)** arguing the flaws of traditional approach to monetary economics. They argued that monetary economics is the demand and supply of loanable funds which is contingent upon the consequences of imperfections of information and role of banks. Moreover, monitoring and enforcement involving risk taking. The key to understanding the behavior of banks is their ability to absorb risks and adapt to changes in the economic circumstances.

In advocating the new paradigm, fundamental differences between credit and money can be cited. First, there are several institutional arrangements from where credit is provided. Any attempt to restrict banks can open new avenues and divert credit creation ability towards non-banks sources. Second, credit market is not cleared by market mechanism instead rated by lender on the basis of risk profile of the borrower**.** **Kashyap and Stein (1995), Peek and Rosengren (1995)** implicitly postulated credit market as an imperfectly competitive market because of the sunk cost associated with

acquisition of information and only few lenders will have full information. Third, the allocation of credit through credit certification tends to generate excess credit demand without correction action related to rise in interest, therefore exacerbating the problem. Finally, the credit-interest nexus is complex one with interdependence between lenders and borrowers, leaving financial system utmost fragile. Such non-linearity and associated reversibility are genesis of a financial crisis.

Besides, most of the literatures entail bank size as an identifying factor, underlying the idea that small banks face comparatively larger informational risks than large firms which can easily attract funds. It comes at odds when analysis of heterogeneous behavior of banks of India in price setting is highly neglected in the existing literature though it would have real effects on investment and consumption. If there are no changes in lending it is also claimed that bank-specific characteristics (like size, capital) also influence loan supply movements. During monetary tightening, small banks which are mostly financed by deposits and equity, poorly capitalized banks with little access to uninsured deposits drop their supply of credit **(Kashyap and Stein 1995, Peek and Rosengren 1995 and Van de Heuvel 2001a, 2001b).** This makes probing of dynamic bank interest rate setting behavior and adjustment of bank spreads for various bank loans categories help better in understanding the monetary policy transmission mechanism (MPTMs) along with uprooting the factors driving such process.

3.1 Liquidity Mismatch

The other element counts the extent of relation with various determinants of price-setting behavior of banks **(De Bondt 2002, 2005)**. Indisputably, bank competition from other banks and financial markets has a significant favorable effect on the pass though effect as financial innovation (securitization) does. All such exemplifications inarguably create evidence that banks have some degree of market power. Adverse selection and moral hazard problems owing to asymmetric informational problems result in banks choosing to not accommodate loan rates in response to regulatory policy rate.

A liquidity condition on any particular day is calibrated while equilibrating demand for reserves by bank and supply of liquidity by RBI. The RBI makes liquidity

provision to banks at an interest rate to commission them to carry out the regulatory reserves requirement in consistence to policy rate. There is no liquidity mismatch as long as liquidity deficiency parallels the liquidity supply. Thus, this burgeons an environment of close alignment of inter-bank rate with policy rate. But banks are susceptible to exigency liquidity shock thus crept deviation of inter-bank rate from policy rate. During such contingency of discretionary policy actions or autonomous liquidity factors, RBI provides liquidity through LAF, OMOs to address structural liquidity deficit. The impingement of liquidity condition leans on the extent of liquidity offered by RBI. A guaranteed extension of liquidity by RBI is circumscribed and then the increase in indulgence in unlimited liquidity in micro-market leads to a playground of high Net interest Margin spread and increase of volatility. Therefore, assessment of Money Market is relevant within the overall context of its stage of financial development.

Wurtz (2003) and **Moschitz (2004)** through their study agreed about the level of overnight rate that are largely conditioned by demand and supply of bank reserves although its level is set by macroeconomic condition. Bank with surplus of required reserve indulge itself in inter-bank market dictated by profit maximization behavior within adherence to reserve requirement stipulations. Further the banks own resolution to hold higher or lower reserves determining the extent of liquidity equilibrium. The work of **Cochrane (2001)** and **Moschitz and Julius (2004)** also acceded that any mismatch is bridged by RBI alone as a sole supplier sufficing the proposition that RBI plays a vital role in determining overnight rate. On the contrary, a change in the overnight inter-bank rate[8] is anticipated to get transmitted to plenary of term structure interest rate[9] which sooner or later affects the investment and saving resolve of economic agents.

Ghosh and Bhattacharya (2009), Patra et al. (2016) and **Valmiki (2006)** also endorsed to analyze the devices of overnight inter-bank spread, i.e. difference between WACMR and policy rate under New liquidity management framework (NLMF) during 2003 July- 2016 December with the use of integration techniques to evaluate the continuity of spread. The model suggested a change in spread since

[8] Short end yield curve
[9] Expectation Hypothesis

introduction NLMF and also a high WACMR spread controllability with decline in spread was noted.

Bhattacharya, Roy and Patra (2009) studied daily data on bid-ask spread with the objectives of the study Money Market in India and its interaction with operational framework of Monetary Policy. Using GARCH model (1,1) they estimated dominance of policy intervention over microstructure across term structure of money market. The findings contributed to the aggravating interaction of RBI with the money market.

3.2 Money Market and Commercial Bank

The call Money Market is also called overnight rate and it makes the uttermost incipient factor of the yield curve and hence likely observed as being on the whims of the central bank. Thus, it stands imperative for the apex bank of any country to understand its mechanism for an efficient Monetary Policy working. The WACMR operates as the shortest inter-bank rate and being a crucial starting point of the term structure, the rate arrives as a decisive instrument in the implementation of Monetary Policy. Various Central banks including India have set it as the operational target encompassing it under its controlling arena and thus allowing it to have a notable signaling significance as regards to Monetary Policy stance.

Money Market is considered 'special' in the backdrop of mounting orientation by RBI for re-scheming of the operational framework in proclivity of influencing interest rate for MP execution. As **Bhanumurthy (2005)** and **RBI (2007)** show, keeping track of the policy regime re-stategisation, MM has been an emerging segment and also a forward looking transmission of policy impulses across financial system. An efficacious money market environment is regarded indispensable for unearthing information leaning around expectation and its impulses to real economy. **Indranil Bhattacharya** also theoretically and empirically took cognizance of the significance of money market route, term structure of interest rate and bank reserves and followed by the realization of dominance of RBI over conduct of MP lying solely sui generis supplier of bank reserves (majorly posited by **Freidman 2000**) which is currently impeded through the rising scale of money market system.

RBI (2007b) remunerates the fact of low interest earning and in some countries even unremunerative bank reserves which encouraged banks to exchange them for interest bearing asset. With the demand of MM instrument, followed high security process and descend of interest rate. Only when market interest rate stop to a footing where banks conjointly hold all reserves that RBI has supplied, does the financial system reach equilibrium. This is the way RBI influences the money market instrument along with other regulatory measures of imposition of reserve requirement. Such commerce between institutional framework of Monetary Policy and market microstructure is presented in creative papers of **Ho and Saunders (1985), Campbell (1987)** and **Spindt and Hoffmeister (1988)** opining pattern of volatility in bid ask-spread of money market showcasing the essential requirement of understanding the Monetary Policy ability to impact aggregate demand via Money Market.

RBI (2007b) publishes about overnight rate as an administered operational target being ascertained in the inter-bank market for settlement balances and granting of repo rates as the major business factor in the day to day management of liquidity.

Owing to **Singh (2011), Bhattacharya and Sensharma (2007), Disyatat and Vongsinsirikul (2003) and Walter Bagehot (1873)[10],** the stochastic arrival in context to demand for loans and supply of deposits, giving way to maturity mismatch faced by the bank in the form of interest rate risk that reduces profit and capital accumulation in regard of two forms of risks: reinvestment opportunity risks, i.e. the risk of rolling over maturity contracts at a disadvantageous rate and valuation risks, i.e. the risk that changes in interest rate deducts the net present value of bank's loan and deposit portfolio. It is referred to as maturity mismatch. If there is arrival of deposits in discordance to demand for new loans, the bank will have to invest the funds in the money market at short-term interest rates. Here there would be a case of refinancing if the market rates happen to fall. In the contrary case, as clearly postulated by **Mohanty (2010)** and **RBI (2007**), the banks will need to borrow to match the demand for loans, and may happen to engage in refinancing risk if short-term market interest rates go up. Banks are also exposed to cost emanating from derivatives with maturity transformation effect leading to bank spreads. To fight fall in bank profits in the case of banks holding more rate sensitive liabilities than assets,

[10] Lombard Street Book

banks take recourse to derivatives. These are also embroiled with cost like premium demanded by hedge counterparty and can be reflected in higher bank interest rate.

Under the tutelage of **Monti (1972)** and **Klein (1971)** influential paper, banks have a price setting power in the loan and deposit market but no authority in the interbank money market or bond market, a recourse when seeking for borrowing additional funds and supplementing surplus liquidity. Literatures studying bank interest rate setting behavior generally assume that banks operates under oligopolistic market conditions where it is not a price-taker but sets it under the interaction of supply for loans and demand of deposits. However, an increase in the interbank market rate (e.g., the Fed funds rate) has a disparate effect on the optimal bank interest margin depending on whether the bank is a net borrower (positive effect) or a net lender (ambiguous effect) in the interbank market. Identified undeniably, cost of funds (a component subject to vary widely in ongoing quarters) is a measure of marginal cost of lending like opportunity cost is for deposits **(Asubel, 1991).** This can be paraphrased; the spread between retail deposit rate and market rates is the opportunity cost of deposits to depositors and profitability of deposits for the banks **(Hutchinson, 1995).**

Firstly taking demand for loans, it is positively related to GDP and inflation, i.e. economic prosperity bringing profitable projects in terms of positive net present value especially stressing the permanent and not the transitory part of income, increasing the demand for loans and uplifting the lending interest rates. Such scenario also increases money market rates, thus increasing opportunity cost of other form of financing (bonds) and further increases loan demand. Inverse is the case with deposit demand which fall during GDP growth. It is in such way negatively related to real GDP and inflation that when level of income rises, it increases demand for deposits and thus reduces the incentives for banks to set higher deposits rates. However, it must not be left attended that on the opposite side, the increase in money market rate may make risk-free assets more attractive, disdaining deposits. This subsequently increases the deposit interest rates.

SECTION 4

Evolution of India's Monetary Policy Framework

The decision making of Monetary Policy is polarized by the Governor of RBI who decides in assistance of Deputy Governor releasing periodic publication of RBI of motley of significant market variables along with data on cash balances with RBI, the liquidity injection/absorption under LAF and others are herald daily. This own balance sheet is released weekly while banking consolidation on a fortnightly duration. The comprehensive gamut of macroeconomics and financial data are broadcasted through RBI monthly bulletin and annual publication.

The monetary framework of India has been shaped in a phased manner in response and backwash of financial progression, globalization, reform shifts.

Phase 1: 1935-1950

Centered to check the demand for and supply of credit. Bank rate, open market operations and reserve requirement were the nerve centre of monetary policy instruments.

Phase 2: 1950-70

Marking a spring of development phase, this period saw a bloom of quantitative control measures askewed towards reining inflationary pressures. Securing equitable capital and preferred credit disbursement, bank rate cinched as the target instrument.

Phase 3: 1970-80

Keeping up with the last planned phase, this time division emphasized over credit planning and thus inclined to govern Statutory Liquidity Ratio and Cash Reserve Ratio to counterpoise inflationary conditions.

Phase 4: 1980-90

Early 1980s witnessed a conformation of a formal adoption of Monetary Policy Targeting Framework where reserve money held as operating target and broad money

(M3) as intermediate target. By the mid, the economy saw the onset of structural reforms off-shooting a incipiency of paradigm shift, giving way to market-determined interest rates and exchange rates.

Phase 5: 1990-00

Narsimham Committee Report (NCR)-I witnessed various fiscal measures in line to organize eventually the unlimited automatic monetization of fiscal deficit. **Jadhav (2000)** advanced the more deregulated pattern of interest rate where monetary policy was made free from fiscal dominance. Late 90s presented to the economy a holistic shift in the framework of monetary policy, in its liquidity management operations. The wide-ranging reforms led to a momentous reduction in cost of banking like Prime Lending rates, SLR and CRR; during 1991-04 yet priority sector lending prevailed. So far RBI preferred 'money' based stabilization which then turned to preference for an assembly of information on varied indicators to create clear-cut platform for a study interest rate channel. There was a gearshift from direct to indirect market-based variables. RBI launched a full-fledged Liquidity Adjustment Facility (LAF) undertaken with repo operations. Under implicit limitations due to dearth of any single policy rate and a defined corridor width, the interest rate instrument faced a default. The mid of 1998 based on RBI 1997-98 Annual Report experienced the failure of monetary targeting and as the Third Working Group evidenced the changing nature of transmission mechanism and growing importance of interest channel. The Presidential address[11] of YV Reddy of RBI also put forward substantiation of increasing popularity of rate channel over the quantum channel.

Phase 6: 2000 onwards

A new and modified Monetary operating framework where Weighted Average Call Money Rate (WACMR) explicitly cognized as an operating target of Reserve Bank and repo rate as a single independent varying policy rate. This switch stresses the ascendancy of interest rate channel where on a movement of policy repo rate synchronously move the overnight interest rate and ultimately transmit it to structure of interest rate and bank lending rates to bring relevant control over aggregate demand and prices according to **RBI (2011).**

[11] Indian Econometric Society, 2002

The proper consummation of the above series of activities depends largely over the extent and speed of perpetuation of RBI signaling through the financial markets. This involves dual stages; first policy action spread via altering financial prices and quantities, and second, financial prices and quantities alters the real economy by affecting their spending and investment decisions of consumer and firms, respectively. This sums up the revelatory presence of financial market development on which policy actions hangs. Encapsulating, greater the financial market evolution, better the policy's realization through interest-rate linkages.

SECTION 5

Dependent and Independent Variables

5.1 Monetary Policy Variable

Like concerted efforts of amendments by Emerging Market Countries in manifold, India (as conceived in the last sections) has also sustained multiple phases of transition from Monetary Targeting to interest rate adjustments. Thus, as endured by the literature and undergoing experience of Indian Economy, henceforward, Interest rate is preferred as the optimal policy variable in our research study.

5.2 Choice of Interest rate

A clever fashion of valuating the current policy framework or guesstimating the best framework warrants a formidable choice of interest rate. To our knowledge, we have divers of interest rate types, but the choice of selection in the modeling necessitates one which better reflects the RBI intentions and shares greater correlation with the policy variables.

The policy agents under immediate administration of RBI's disposition are the standard reference or benchmark criterion for all the other interests rates dispersed in the Indian financial market. These are the nominal policy interest rates that influence both the real and nominal market rates keeping in care superintending the financial risk, expectations of the rational public and lopsidedness from the international markets.

For the study in concern, the policy interest rate comprehended proficient is ruminated based on the given arguments noticed by authorities of Monetary Policy itself and is also indicative of the empirical evaluation the recent literature has taken cognizance of.

Body of written works on India assembles a vast literature circulating about the functioning of Monetary Policy, enumerating detailed count on short term call money rates and repo rates, to medium term bank rates and long term government security rates. The short term rates better synchronizes with policy rates as also attested by **Nath and Raja (2012)** supportive of a far rapid outreach in transmission of monetary policy. As with the working of Liquidity Adjustment Facility (LAF) of RBI, short term rates like Weighted Average Call Money Rate (WACMR) and Collaterised Borrowing and Lending Obligations (CBLO) have more deliberate contemplation in monetary framework about and over[12].

LAF is a corridor set by RBI to assist banks in day to day liquidity deficits and surpluses in liquidity brought about by timely SLR/CRR reservations. It has coherence between repo or reverse repo transactions, call rate and Marginal Standing Facility (MSF).

Repo or Repurchase is a security based loan available to banks to borrow from a central bank with an agreement to repurchase the collateral in some preordained rate and date. Reserve Repurchase Agreements is when central banks borrow money from banks by collaterizing at the reverse repo rate. Accordingly, a central bank conditions the Repo (leading to injection) and Reverse Repo (leading to squeezing) operations in alignment to policy rates and this makes the monetary framework an indirect short term rate based since early 2000s. Repos and reverse repo is advocated in the study by Nath (2014) of its low credit risk, flexibility in consonance to central bank's objectives and the offered advantage to banks who can buy securities collaterized to meet sine qua non SLR.

The call rate market is an interbank non-collaterized market (with banks, RBI and primary dealers as participants) for short term funds with maturity ranging from one day to 14 days. Being a clean market with no offer of a security as collateral, it turns

[12] A detailed literature review is presented in the consequent chapter.

out to be a highly volatile dovetailing the demand and supply. But also as countenanced in the seminal empirically designed study of **Singh (2010)**, who found a close mirroring of movements of call rates united with CRR, before introduction of LAF and a discerned containment around repo post-LAF.

This was LAF that created a forum for interest rate as an instrument of monetary transmission. The debate over the non-uniformity regarding the use of single policy rate followed by its folly to jump to either repo or reverse repo in resonance with liquidity condition led to the surfacing of its first weakness. Henceforth, such free mutation careened into mostly crossing of the overnight rates outside of the firm corridor. Upending such emanations called for a revised monetary policy operating procedure in May 2011 by RBI revamping the LAF framework with some new proposition without ousting the old ones. The weighted average call money rates was registered as the policy operating target with explicitly apprehending repo rate as the independent varying policy rate. The new Marginal Standing Facility (MSF) established 100 basis points above the repo rate for borrowing for Scheduled Commercial Banks up to 1% of their Net demand and Time liabilities. **Sengupta (2014)** assured in his paper the policy rate corridor as of bound within the range of 200 basis points with repo rate in the middle, reverse repo below it and MSF above it.

SECTION 6

Taylor Rule: Scope of Monetary Policy rule

Monetary Policy Rule aims to settle a balance between information and unemployment. Likewise, Taylor rule fortifies as a rule of thumb mathematically formulated into a simple equation for estimating behavior of Federal Reserve of US with investment of current output and inflation Gap.

Target Nominal Rate = Inflation rate + Real interest rate + a*(inflation gap) + b*(output gap)

$$r_t = 2\% + 0.5\,(y_t - y^*) + 0.5\,(p_t - 2\%)$$

r_t is the targeted federal funds rate and Federal reserve watch over its target rate and accordingly adjust in relation to actual rate.

Taylor Rule Principle enunciates:

1% increase in inflation = Central Bank need to increase target rate more than 1% nominal interest rate.

Here, 0.5 represents the relative weight the Fed places on achieving goals

Taylor like Monetary Policy Rules has been proffered since the beginning of the economy. As **Adam Smith (1776)** argued that a well-regulated paper money could improve economic growth and stability. The same cogitation was shared by **Henry Thornton (1802) and Robert Hetzel (1987)** who poses the responsibility of central bank in price level stability discouraging discretion based mechanism.

Knut Wicksell (1907), Irving Fisher (1920), Henry Simons (1936), Milton Friedman and Taylor and Williams (2011) share the common idea of simple MP rule without self-discernment. A rule based policy for interest rate and money supply abates economic turmoil in order to avert shocks of inflation, financial crisis and recession.

The onset of research of Monetary policy in the recent years charted new snowballing and intricate designs of econometric modeling (First macroeconomic model rolled by Jan Tinbergen). This further pulled forward shift in the Monetary Policy better evaluative model. There was a reposition of policy assessment from "rule-based[13]" to "path-based[14]".

The new stochastic dynamic model entails a simulation of policy rules which were complex and raised mistrust over the practicability of the entire "rule-based" framework. It led to a huge change in the type of advocacy of efficiently evaluative policy rule popularly stationed by **Kahn (2010), Ahrend (2010), Kahn (2012), Gray (2013), Carsten (2015) and IMF (2015).** They reported a departure even before the crisis surfaced in the economy when the interest rate were set too low for too long feeding large macroeconomic and financial gaps and termed it "Global Great Deviation". Furthermore, Federal Reserve Fed Open Market Committee (1990) and

[13] In the "path-space" one estimates the impact of one time change in the path of the policy instrument on target variable.

[14] In "rule-space" on estimate the impact of policy ruke fir the instrument on dynamic stochastic properties of target variable.

speeches of **Larry Summers[15] (2013)** also alluded Effective lower bound (ELB) on interest rate also gravely tying the hands of central banks.

Prior to economic reforms, India had been a closed economy and the policy was tightly administered and governed in a very complicated interest rate structure with not enough liberty to influence. **Bhattacharya (2006)** also contends that Taylor rule is not supposed to work in such a framework like India and rules could only be a success after the repeal of the controls. **Boris (2011) and Michael Woodford (2001)** claim that the traditional Taylor rule is inadequate for it leaves out of scope the factors which actually stand relevant and crucial enough to be captured. Also, policy instruments specifically like reserve requirement, total asset of banks, etc., are likely to have significant impact not encompassed by Taylor rule and thus might be emanating misleading analysis. They also argued in favor of adjustable intercept responsive to fluctuation in place of constant rigid rather than read disturbance.

Keeping in account the above literature, this thesis serves in absence of the influence of Taylor Rule in the study of the assessment of the speed and elasticity of Monetary Policy in a monetary sector.

SECTION 7

Research Methodology

This model is a least square regression model containing lags of dependent and independent variable.

7.1 Assumptions of ARDL Model

- If variables are stationary at first difference, i.e. integrated to the order 1 but not I(2).
- Estimated with appropriate lags.
- Errors are serially uncorrelated.
- Model dynamically stable.

[15] American Economic Association

- In case of mixed form of stationarity, i.e. if variables are stationary at levels and also at first difference.

7.2 Advantages

According to **Alam and Quazi (2003)** estimation using ARDL model is possible even in challenge of endogeneity of explanatory variable as long as the model is free from residual correlation.[16] This model stands unique against the Engle–Granger cointegration analysis where ARDL method can discern between dependent and independent variables. Moreover this method also has a vantage position in proceeding with consistent long-run parameters that are asymptotically normal regardless of whether the variables are I(0), I(1) or mutually integrated. One of the main advantages of ARDL modeling lies in its flexibility, as it can be applied when the variables are of different order of integration **(Pesaran & Pesaran 1997).** Another inside track of this approach is that the model uses competent numbers of lags to capture the data generating process in a general-to-specific modeling framework **(Laurenceson & Chai 2003).** Its popularity also heads from the fact that cointegration of non-stationary variables is equivalent to an error-correction (EC) process (for the linear transformation see: E.g. Banerejee et al. 1993), and the ARDL model has a reparameterization in EC form **(Engle & Granger 1987; Hassler & Wolters 2006).** The EC integrates the short-run dynamics with the long-run equilibrium without losing long-run information and the existence of a long-run cointegrating relationship can be tested based on the EC representation. In addition, it is also argued that using the ARDL approach avoids problems resulting from non-stationary time series data.

As this empirical and theoretical research intends to enquire about the long-run relations, our focus is towards modeling the series as stationary distributed lag or autoregressive distributed lag (ARDL). The long-run properties of the model are estimated and analysed using standard asymptotic normal theory on variables differenced stationary or I(1). This thesis aims at estimating using the Autoregressive Distributed Lag (ARDL) approach to co-integrating testing rather than the single

[16] Pesaran and Shin (1999) set forth that appropriate lags in the ARDL model are corrected for both residual correlation and endogeneity.

equation testing for co-integration based on Johansen residual based tests where pre-testing is also not required for the order of integration.

Based on **Pesaran, Shin (1991)** and **Pesaran, Shin and Smith (2001),** this technique is based on single ARDL equation thus reducing the number of parameters and also number of lags can be applied to each variable separately unlike VAR as in Johansen approach.

A data generating process is represented by a general VAR of order p which is rewritten in vector ECM form constituting vector z of variables focusing on the conditional modeling of the dependent scalar variable y. In that front, vector z is partitioned into the scalar y and vector x of dependent variables.

To examine the negation of level relationship between y and x, the approach used is F-statistic to test for joint hypothesis that all the coefficients of all lagged variables in the ECM equation are zero. **PSS (2001)** segregates five cases of ARDL approach to co-integration specifically; no intercepts, no trends, restricted intercepts, no trends; unrestricted intercepts. The resulting ECM may be inference as autoregressive distributed models of orders (p, p,...p) models where the F-statistic has asymptotic critical value bounds for all the cases. If the computed F-statistic fall outside the critical value bounds, the test allows a conclusive evidence without discerning about the integration situation of the underlying regressors. Whereas, if the F-statistic fall within the bounds, inference stands inconclusive and before advancing further, comprehension of the order of integration is required. If F-statistic lies below the 0.05 lower bound, there is evidence of no level relationship. Hence, 'no level relationship' hypothesis cannot be rejected at 5 percent level.

A VECM envelops the long run relationship and short run dynamics contemporaneously that propels variable back to its long run equilibrium path aftershocks that had provisory driven it away from long run equilibrium. ECM model estimation needs a more parsimonious route. There comes at rescue the ARDL approach[17] which is selected in a systemic search analysis testing the lag orders using information criteria like AIC or SBC.

[17] Pesaran and Shin (1999)

7.3 Stationarity

These tests are conducted to eschew the existence of spurious assessment in two folds:

One, the Null Hypothesis is that series is stationary using KPSS test.

Second, Unit root tests such as Augmented Dickey Fuller tests. The study has used Augmented Dickey Fuller (ADF)[18] where the null hypothesis says that the series possess a unit root. If a series is stationary without any differencing, it is said to be I(0) or integrated of order 0. On the other hand, if a series is stationary after first difference it is said to be I(1) or integrated of order 1. After stationarity check, co-integration is checked using OLS based autoregressive distributed lag (ARDL) approach to co-integration is applied which involves a bound testing procedure to draw conclusive results without even finding out whether the variables are integrated of order zero or one.

[18] Dickey and Fuller (1979)

CHAPTER 3

TESTING THE DEGREE OF ASSOCIATION AMONG POLICY RATES AND FINANCIAL MARKET RATES

INTRODUCTION

Colloquy among economists and researchers often spouts arguments regarding the need of a model that can triumphantly simulate the expectations upon which private factors ground their decisions. A clear market expectations, bank credibility and transparent accountability are emergent to policy success. **Lucas (1976)** argued that an economy and policy makers are intertwined and public expectation in the form of feedback rule are followed by policymakers. William Poole, Robert Kasche and Thornton highly avouch its importance in macroeconomics since market interest rates have been largely used to parse out the unexpected components of policy decision.

Particularly, in deliberations as well in as major works of literature on monetary system, momentarily links monetary decisions aimed at influencing the real sector through banking sector. Here, financial markets, i.e. money market and capital market play a consequential role and engage significantly in the operation of MPTMs. The cardinal purport of financial market is to turn over funds from the lenders to the borrowers. Economic agents usually face a lack of coherence in their disbursements and their incomings against adhering to autonomous factors; bank notes in circulation and government deposits and central bank's minimum reserve requirement. As the money market lends for a period of year or less, any lopsidedness in the receipt and expenditure of commercial banks is offset by it. These units can hold transaction money balance in the form of currency and deposits on demand, independent of cash, to keep up with the planned expectation of a country's apex banks signaling with respect to the echelon the economy prevails in. The seminal paper of **Wurtz (2003)** upholds the thought that financial market is the point of onset of the transmission channel of monetary policy while considering India, the rate of overnight inter-bank loans is the RBI's operating target. Thus, for a productive conduct of monetary policy, it becomes necessary to know the functioning of inter-bank MM.

Subsequent to major financial sector and economic reforms, the economy attested a firm implantation of financial instruments in the monetary policy running. As the

financial market involves costs in the form of foregoing interest when holding of the balances of commercial banks, economic unit held money market instrument. These instruments minimized the cost and provided quick cash conversion and were also low price risk due to short maturity. It reallocates the liquidity primarily supplemented by central banks to influence the awaited and un-awaited everyday liquidity inadequacy **(Cook and La Roche, 1998).**

Outline of the Chapter

The following chapter is formalized into four sections. The Section 1 assays the objectives of the concerned study. This is followed by examination of the association shared by the monetary variables in Section 2. The Section 3 encapsulates the major evidences of correlation through trends and correlation tests. Then, Section 4 culminates the chapter with the conclusion.

SECTION 1

Objectives

As the name of the chapter suggests, the objective of the paper was to test the actuality and the sensitivity of the so-called credit lending channel, the researcher's focus remained around the short term liquidity instruments of inter-bank call money rates and bank's base rates in a policy controlled years of 2004-2015 respectively. Following were the objectives are to be tested:

- To test the relation between policy rate and operating target.
- To test the relation between RBI policy rates and bank's base rate.

SECTION 2

Substantiation of the Degree of Association

2.1 Scope of Commercial Banks association and its reliance on Money Market

As commercial banks position a crucial role in MP transmission its conjugation is indispensable. Commercial banks field in three significant jobs on money market.

First, they appropriate capital to fund their loan portfolio and likewise to offset the non-interest bearing reserve resolutions of RBI through overnight rates. Second, they palter in money market through repurchase agreements. Banks execute the capacity of a dealer in the market for over-the-counter interest rate derivatives. Such derivates places terms in the market for the exchange of cash payment based on consequent modifications in market interest rates. Third, banks give commitment of furnishing of timely payment to investors of securities in exchange of a fee.

Another reason for the commercial banks to have concatenated relations with the money market is their motivation to sustain its speculative aspirations. Also due to major presiding of heterogeneous bank sector, different banks face different cost for borrowing from central bank and this is based on decent collateral which varies across polarized on bank's capacity of holding eligible securities.

2.2 Scope of Central Bank association and its reliance on Money Market

RBI has exerted a dominant impact over the operating procedure through determinateness of policy rate and fixating the terms upon which borrowed and non-borrowed reserves are made available to banking system. And this proviso which truncates the liquidity conditioning of a bank instigates them to trade for funds in money market. Therefore, policy rates are the rates to which money markets are anchored. Market participants determine money market rates in prospect to present and foreboding RBI policies.

At times of liquidity imbalances, the banks has options to raise funds either by issuing Certificates of deposits or by borrowing daily through overnight rates; whichever option yields cheaper. Such arbitrage at the banks discretion make contemporary as well as anticipated RBI policies towards the policy target variables a key determinant of money market in general **(Kuttner, 2001).** These market instruments catch future course of monetary policy to measure monetary shocks. As **Refet S. Grukaynak Bilkint** found, financial market instruments delivers far splendid predictive power accruing suggestive implications for market based measures of monetary innovations.

This calls forth weighted average call money rates based measures of policy expectations to measure policy shocks. Creative paper of **Kuttner (2001)** found federal funds future rates to be the best measure of shocks to immediate policy setting. **Kuttner (1996)** and **Rudebusch (1998)** were the first to explore this approach. As there are proliferations of short term interest rates that potentially measure RBI expectations, it is important to use the relevant asset.

Over the last decade, there has been substantial development in the Indian money market in terms of depth, variety of instruments and efficiency. It provides an equilibrating mechanism for demand and supply of short-term funds and in the process provides an avenue for central bank intervention in influencing both the quantum and cost of liquidity in the financial system, consistent with the overall stance of monetary policy. The development of the money market over the years and relative stability in the call money market enabled the Reserve Bank since 1998 to move away from quantity-based instruments to price-based instruments under its multiple indicators approach adopted. Accordingly, the overnight call rate, which was used implicitly as operating target since the institution of liquidity adjustment facility (LAF) in 2000, became explicit after the adoption of a new operating procedure in May 2011. More importantly, efforts were made to transform the call money market into primarily an inter-bank market, while encouraging other market participants to migrate towards collateralized segments of the market, thereby increasing the overall market stability and diversification.

In order to facilitate the phasing out of corporate and the non-banks from the call money market, new instruments such as market repos and collateralized borrowing and lending obligations (CBLO) were introduced. By August 2005 non-bank entities completely exited the call money market. In order to minimize the default risk and ensure balanced development of various market segments, the Reserve Bank instituted prudential limits on exposure of banks and primary dealers (PDs) to the call/notice money market.

Even though the share of call money market in the overnight money market is lower than that of collateralized segment, the weighted overnight call rate is used as operating target. This is partly on account of high correlation between the overnight

call money rate and the collateralized money market rate. The issue was examined in detail by the Working Group on Operating Procedure of Monetary Policy which observed that the transmission of policy rate to the overnight call money rate is stronger than the overnight money market rate. In addition, the call money market is a pure inter-bank market and, hence, better reflects the net liquidity situation.

In the process, money market plays a central role in the monetary policy transmission mechanism by providing a key link in the operations of monetary policy to financial markets and ultimately, to the real economy. There is an oncoming issue of choosing a rate of interest which captures well the monetary policy stance post the operationalization of LAF corridor of daily repo and reverse-repo auctions. Repo rate (policy rate) can be used to indicate monetary policy stance, but it is the over-night call money rate which heralds the expectations of monetary policy stance as the policy shock affects the short-term rates which disturbs the monetary and financial variable, thus bothering the aggregate demand[19]. In the context of the extent and timing of intervention in the money market, the overnight call money rate is preferred over other short-term rates to capture the monetary policy stance. Like as per the holdings of **Virmani (2004)** who used overnight call money rate as monetary policy instrument to ascertain the monetary policy rules for India. To corroborate the choice of intermediate variable, a correlation tests is attempted among the two variables.

[19] Walter Bagehot started his book *Lombard Street* (1873) emphasizes the opaqueness of the money market. Money market, being the overnight market, is crucial for the RBI, as its monetary policy is first transmitted to it. Money market is the key link in the transmission mechanism of monetary policy to financial markets and finally to the market economy.

SECTION 3

Evidence on Correlation between Monetary Variable through Karl Pearson Test and Trends Graphs

Table 3.1: Daily Money Market Overview (Face Value in crores)

Year	Collaterized Borrowing and Lending Obligations	Uncollaterised Call/Notice/ Term Money
2004	2797.00	7947.00
2005	8351.00	11437.00
2006	18402.00	13924.00
2007	26845.00	13997.00
2008	35522.00	15525.00
2009	59149.00	11726.00
2010	52597.00	10937.00
2011	48700.00	15012.00
2012	45507.00	19415.00
2013	67202.00	18887.00
2014	65959.00	16442.00
2015	75823.00	14706.00
2016	81822.00	17984.00

Data Source: RBI Daily Press Releases

Table 3.2: Result of Karl Pearson Correlation Tests

		Collaterized	Callrates
CBLO	Pearson Correlation	1	.603*
	Sig. (2-tailed)		.029
	N	13	13
Weighted Average Call Rates	Pearson Correlation	.603*	1
	Sig. (2-tailed)	.029	
	N	13	13

Here, our nerve centre would be to rummage out an intensified outcome of an unanticipated monetary policy shock through bank loans. The transmission of monetary policy has been explained in the literature through a variety of models. In those models, monetary policy actions influence real variables through various channels. In money-in-utility function model, under flexible prices, an inflationary increase in money supply influences spending decisions through real balances, while in a cash–in–advance model, the impact is transmitted by raising the cost of the purchases. In a sluggish wage-price regime, the IS-LM depicts the impact of monetary policy on real variables. In a closed economy, the key variable in the process of transmission is the interest rate, while in an open economy this role is played by the exchange rate. In the traditional money channel, with the standard IS/LM framework in mind, a monetary policy tightening using CRR instrument, would have reduced the supply of deposits. While in bank lending channel instance, the interest rates on loans and bonds would determine the level of response of aggregate demand and output. This comparison is to count on the fact that RBI controls the real sector not only through supply of deposits but also through supply of loans too which consequently causes additional effect on the real factors.

This examination of the pass-through from policy rates to bank lending rates is estimated in two steps. First, a trickledown effect from monetary policy rate to operating target. Second, a pass-through from target instrument to bank interest rates. This chapter reckons the evidence of bank lending channel and gauges its strength in an Indian scenario. In support of the above, following are the ***hypothesis*** to be tested:

- There is no relation between policy rate and operating target.
- There is no association between operating target and bank's base rate.
- There is no such relation between RBI policy rate and bank's base rate.

Concerning the hypothesis, bank rate has always been considered a good indicator (reference rate) signaling the monetary policy stance. But since the financial reforms LAF, operating through repo rate and reverse repo rate corridor, indirect instruments outgrew as a useful tool to curb short term volatility in the money market since 2000s. From the outset of March 2004, repo rate materialized as RBI's refinance tool in a phased manner displacing bank rate, and since our data ranges from 2004Q4 to 2015Q1, I will engage repo rate as a monetary policy instrument to capture its

standing. But as this is a short term instrument, being left with very short time span, its relation with the real market can be formed through overnight call money rate. Call money market acts as a bellwether for systemic liquidity and an operating target for RBI's monetary policy decisions[20]. As banks primarily borrows in call / notice money to settle its day to day mandatory reserve requirements for CRR, the rates in call market are thus the most closely watched variable as a day to day indicator of overall liquidity in the system. It served as an informal operating target since the advent of LAF.

3.1 Indian Money Markets and the Liquidity Adjustment Facility

The development of money market as well as its growing inter-linkages with other segments of financial markets enabled the Reserve Bank to alter the operating procedures of monetary policy consistent with the objectives of the monetary policy. Under the LAF[21], the Reserve Bank sets its policy rates, i.e., repo and reverse repo rates and carries out repo/reverse repo operations, thereby providing a corridor for overnight money market rates.

Its execution has been an asset in various ways. First, it made realizable the transition from direct to indirect monetary instrument. As it deduced the reduction in CRR without misplacement of monetary control, certain dead load is saved. Second, it gifted greater flexibility to monetary authorities in taking decisions by responding to the needs of the economy on a regular timely basis. Third, LAF targets within a specific corridor and no formal targeting. LAF helped to stabilize overnight call rates within a specified corridor, enabling RBI to affect demand for funds through policy rate. Like such various tools of liquidity management empowers RBI to maintain liquidity conditions as well as operate MP in accordance with the stated objectives. But in view of limited control over long-term interest rates, central banks adopt a strategy to exert direct influence on short-term interest rates. Changes in the short-term policy rate provide signals to financial markets, whereby different segments of the financial system respond by adjusting their rates of return on various[22]

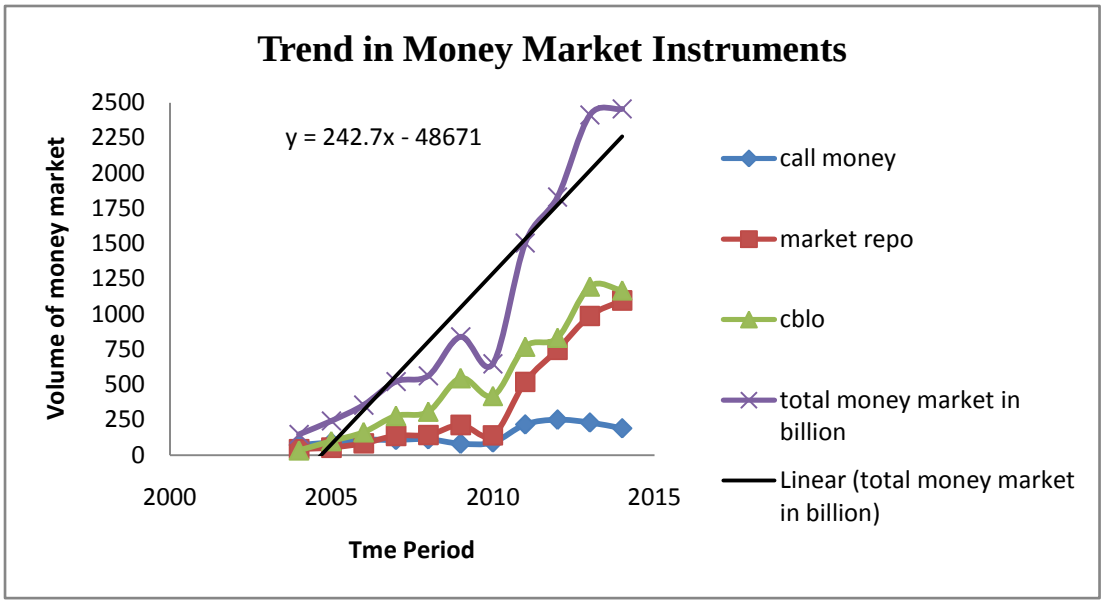
[20] Golakha Nath Ghose, The Indian call money market

[21] In the Indian context, reforms in the monetary policy operating framework, which were initiated in the late 1980s crystallized into the Liquidity Adjustment Facility (LAF) in 2000

[22] Speech by Shri Deepak Mohanty, Executive Director, Reserve Bank of India, at the Seminar on *Issues in Financial Markets*, Mumbai, 15th December 2012. The assistance provided by Sitikantha Pattanaik, Jeevan Khundrakpam, Binod Bhoi and Rajeev Jain is acknowledged.

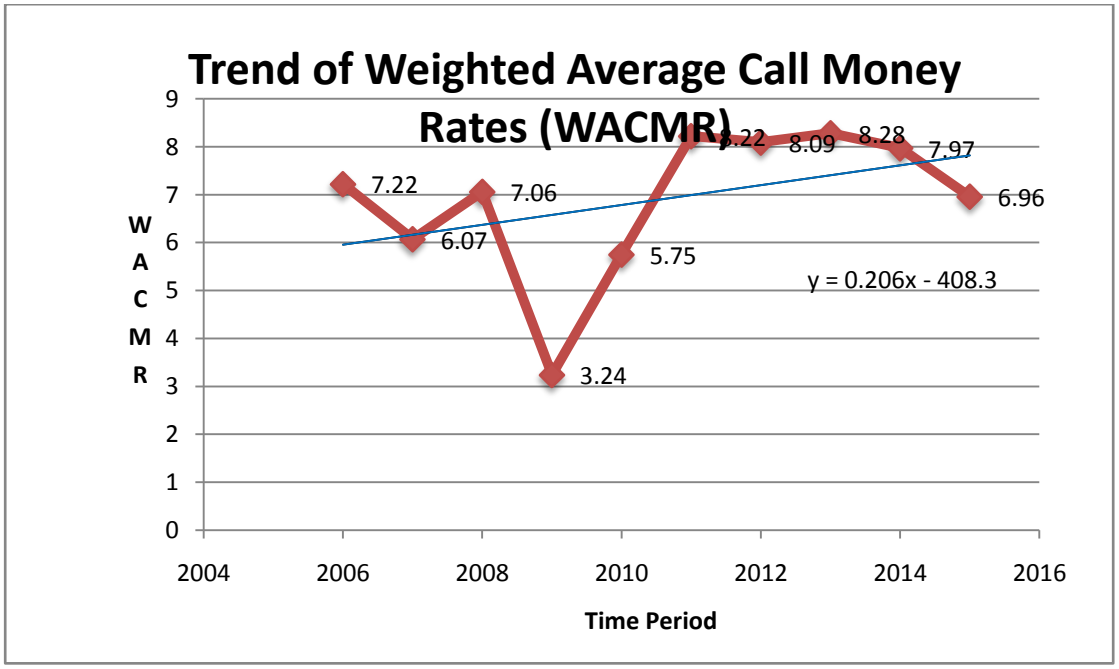
instruments, depending on their sensitivity and the efficacy of the transmission mechanism.

Figure 3.1



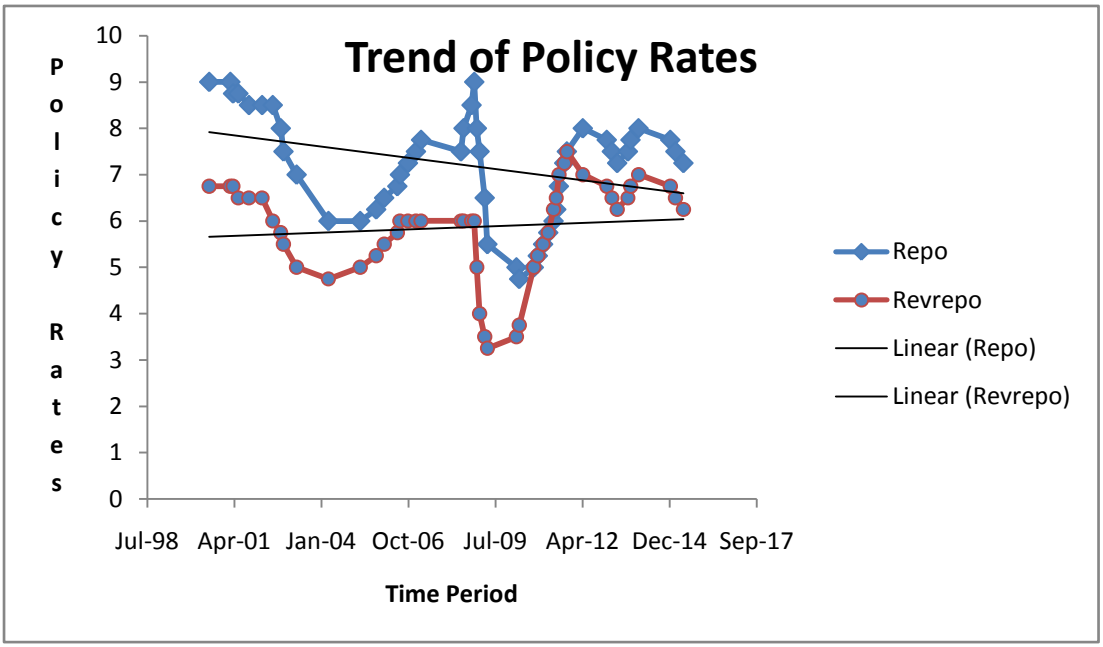
Data Source: RBI Handbook of Statistics on Indian Economy, CCIL

Figure 3.2



Data source: RBI Weekly Statistical Supplement

Figure 3.3



Data Source: RBI Handbook of Statistics on Indian Economy, RBI Annual Report

Hereby correlation is applied between RBI's policy rate, i.e., repo rates and its operating target, i.e., monthly call money rates based on the he data outsourced from RBI monthly press releases and Clearing Corporation of India Limited.

Table 3.3: Results of Karl Pearson Correlation Tests

		WACMR	Repo rate
Weighted average call money rates	Pearson Correlation	1	0.435
	Sig. (2-tailed)		0.209
	N	10	10
Repo rate	Pearson Correlation	.435	1
	Sig. (2-tailed)	.209	
	N	10	10

Report and Justification:

The correlation table 3.3 shows Karl Pearson correlation between call rates and policy rates of 0.435. As the probability value is 0.209, which is greater than 0.05, hence insignificant. It clearly depicts a weak relation between the values of monthly average

call money rates and monthly adjusted monetary policy's repo rate. The reason of this weak positive correlation may be due to the surge in various other avenues of funds inflow in the form of FDI and PIs post liberalization and privatization measures. Also as the data above takes into consideration the immediate change of call money rates in response to policy signaling, we cannot deny that there is some significant time lag in response to monetary policy impact which also needs due consideration. This point will be taken in the next chapter where the extent and speed of pass-through will be looked upon thoroughly.

3.2 Benchmark Prime Lending Rates/Base rate

The constitution of the working group on Benchmark Prime Lending Rates in the annual policy statement 2009-10, BPLR which was introduced in 2003 and was regarded inadequate and not in sync with market conditions as well as monetary policies. Hence, it was reference rate noted in the Monetary and Credit Policy 2001-02 (since the initiation of financial sector reforms) for the bank's pricing of their loans that was believed to be truly reflecting the actual costs. BPLR was computed taking into consideration (i) cost of funds; (ii) operational expenses; and (iii) a minimum margin to cover regulatory requirements of provisioning and capital charge, and profit margin. The Mid-Term Review noted that in a competitive market, PLRs among various banks/bank-groups should converge to reflect credit market conditions and that the spreads around the PLR should be reasonable. However, the divergence in PLR and the widening of spreads between bank borrowers continued to persist. Moreover, the prime lending rates continued to be rigid and inflexible in relation to the overall direction of interest rates in the economy. But it fell short of its expectations when it led to cross-subsidization in terms of under-pricing to corporate and over-pricing to small agriculture, thus losing its purpose.

The base rate was proposed to include all cost elements and indentified to be common among all the borrowers. The actual lending rates charged to borrowers would be the Base Rate plus borrower-specific charges, which will include product-specific operating costs, credit risk premium and tenor premium. The banks were required to carry information on lending rates (minimum and maximum) to the reserve bank on the transparency front. All banks should follow the Banking Codes and Standards

Board of India (BCSBI) Codes for fair treatment of customers of banks, viz., the Code of Bank's Commitment to Customers (Code) and the Code of Bank's Commitment to Micro and Small Enterprises (MSE Code) scrupulously.

In the new system, a bank's base rate is the minimum rate at which it can lend, as loans are to be priced from the base rate with the addition of borrower-specific charges to account for credit risk. Banks are expected to calculate their base rate taking their cost of funds, costs of complying with certain regulations (CRR and SLR), overhead costs, and profits into account. They use their own formula to calculate their base rate, under stipulation from the RBI that it must be calculated in a consistent manner and made available for supervisory review.

3.3 Repo Rate

Banks in India are subject to a statutory liquidity ratio—a certain share of net total time and demand liabilities that banks must invest in gold and/or government approved securities. This ratio was 25% in 2002, and was decreased from 22% to 21.5% in February 2015.

Table 3.4: Results of Karl Pearson Correlation Tests

		Repo rate	BPLR
Repo rate	Pearson Correlation	1	.335
	Sig. (2-tailed)		.344
	N	10	10
BPLR	Pearson Correlation	.335	1
	Sig. (2-tailed)	.344	
	N	10	10

Reporting and Justification:

Table 3.4 shows that banks use different measures of their cost of funds as inputs to the calculation, including using an average cost of funds instead of the marginal cost of funds, has been noted as a potential reason for a lack of responsiveness of their base rates to policy rate changes. Another potential factor affecting transmission is the

share of banks' loan portfolios that are made up of fixed interest rate versus variable interest rate products.

SECTION 4

Conclusion

The assaying of the above two hypothesis via the Karl Pearson correlation tests substantiates a positive but weak credit channel reality. This weak sensitivity of credit behavior of top major five commercial banks is also on account of factors of foreign inflows through FDIs, PIs, etc., and also due to their idiosyncratic asset nature. Moreover, the effect encompasses the immediate response to RBI signal where in reality there is a time lag in their response settlement. The commercial banks do not revert immediately to the policy signals and take almost 2-3 months of response-return. Taking cognizance of these factors will unearth the relying influential variables bringing major behavioral changes since the opening up of the economy post banking and liberalization reforms. These leverage bearing factors will be identified and its extent along with their strength will be tested in the following chapters.

TABLE 3.5

Benchmark Prime Lending Rate/ Base Rate(in percent)													
Year	Jan	Feb	March	April	May	June	July	August	September	October	November	December	Average
2005	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
2006	10.5	10.5	10.5	10.5	11	11	11	11.25	11.25	11.25	11.25	11.25	10.9375
2007	11.75	12	12.375	12.75	13	13	13	13	13	13	13	13	12.73958
2008	13	12.875	12.625	12.5	12.75	12.5	13	13	13.875	13.875	13.25	12.875	13.01042
2009	12.25	12.25	12	12	11.625	11.625	11.5	11.5	11.5	11.5	11.5	11.5	11.72917
2010	11.5	11.5	11.5	11.5	11.5	11.5	11.5	7.75	7.75	7.75	7.75	8.3	9.983333
2011	8.5	9.25	8.875	9	9.25	9.625	9.75	10.375	10.375	10.375	10.375	10.375	9.677083
2012	10.375	10.375	10.375	10.375	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.20833
2013	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125	10.125
2014	10.125	10.1	9.975	9.975	9.975	9.975	9.975	9.975	10.025	10.025	10.125	10.125	10.03125
2015	10.125	10.125	10.125	9.875	9.875	9.85	9.85	9.85	9.85	9.5	9.5	9.5	9.835417
Data Source: A Handbook on RBI's Weekly Statistical Supplement													

TABLE 3.6

Year	April	May	June	July	August	September	October	November	December	January	February	March	weighted average rate
2006	5.62	5.54	5.73	5.86	6.06	6.33	6.75	6.69	8.63	8.18	7.16	14.07	7.22
2007	8.33	6.92	2.42	0.73	6.31	6.41	6.03	6.98	7.5	6.69	7.06	7.37	6.07
2008	6.11	6.62	7.75	8.76	9.1	10.52	9.9	7.57	5.92	4.18	4.16	4.17	7.06
2009	3.28	3.17	3.21	3.21	3.22	3.31	3.17	3.19	3.24	3.23	3.17	3.51	3.24
2010	3.49	3.83	5.16	5.54	5.17	5.5	6.39	6.81	6.67	6.54	6.69	7.15	5.75
2011	6.58	7.15	7.38	7.51	7.97	8.11	8.26	8.58	9.04	8.92	8.81	9.17	8.22
2012	8.62	8.27	8.14	8.05	7.99	7.92	8	8.04	8.05	8	7.8	7.9	8.09
2013	7.53	7.29	7.24	7.76	9.9	9.97	9.03	8.45	8.16	8.19	8.21	8.37	8.28
2014	8.36	8	8.08	8.27	7.98	7.8	7.94	7.83	8.11	7.89	7.69	7.58	7.97
2015	7.44	7.47	7.11	7.04	6.92	7.1	6.6	6.72	6.65	6.7	6.77	6.94	6.96

Data Source: RBI Weekly Statistical Supplement

TABLE 3.7

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Reporate	35	4.75	9	6.9714	1.05505	1.113	-0.339	0.398	-0.561
Reversereporate	23	3.25	7.25	5.6413	1.22897	1.51	-0.676	0.481	-0.58
SLR	6	21.5	25	23.3333	1.25167	1.567	-0.238	0.845	-0.574
CRR	17	4	8.75	5.8571	1.55609	2.421	0.521	0.55	-0.975
Valid N (listwise)	2								

CHAPTER 4

EMPIRICAL EVIDENCE OF MONETARY POLICY TRANSMISSION FROM POLICY RATES TO WACMR IN THE PRE-NEW MONETARY POLICY REGIME

INTRODUCTION

The focus, followed from the last chapter, is upon the first stage in the credit channel through which RBI can affect output; videlicet the pass-through from policy rate to weighted average call money rate (WACMR). In the endeavor to examine the behavior of the policy transmission, the emphasis is on the second largest financial market instrument, i.e., WAMCR. As far as factor for policy instruments are concerned, we are selecting Bank rate, CRR and SLR, as these variables medium term impact on bank lending channel of monetary policy is direct and quite quick. In our travail towards examining the hypothesis of the study, we have attempted a regression model where the influence of bank rate on call money rates is tested for the period 1985M1 to 2001M3.

The Plan of the Work

The chapter is structured in the following way: In Section 1, we focus on the background of India's monetary policy transmission mechanism in terms of India's interest rate regime literature review. Section 2 surveys the methodology used in this as well as the following chapters. In Section 3, objectives are defined and follow up hypothesis are framed. The data analysis, econometric specification has been furnished in Section 4. Then Section 5 demonstrates about the empirical results derived and its interpretation. Lastly, Section 6 draws the conclusion.

SECTION 1

Review of Literature

The problem faced by a developing country like India is that there is a lack of clarity on how the RBI policy actions affects the economy, for the case is that even though

the policy affects, it does not mean it doesn't reacts to it. There is no denial that monetary authority feat reflects the policy maker's expectations about the economy developments, but the following figures also add up the real sector's development feedback. Thus for a thorough result, there is a dire need to distinguish for the matter of our concern, between the consequence of the RBI actions and the variables it reacts to, primarily a variable that is un-reactive to any other variable. As the series are serially correlated and while using economic data, the endogeneity and exogeneity of variables are vague, we first strive to use a VAR model to check for their plausibility. VAR is estimated using monthly data of financial market instruments with vectors namely log Bank Rate, log CRR and log SLR.

1.1 India's Interest Rate Regime Trajectory

The Indian interest rate policy has been a target of phased and incremental progression by the Reserve Bank of India in a complicated system of adjustments of the caps and ceilings of interest rates. It is since 1964 that the deposits rates and since 1969 the lending rates are fixed by RBI. Subsequently, since 1973 the Indian Bank Association decides the ceiling of the call rates. Limiting to the dataset chosen, from 1985 onwards there is a shift from an administered to semi-administered policy when liberalization took its leap. The **Chakravarty (1985)** recommendations were inclined towards imparting of flexibility[23]. Ceilings on call rates were repealed with effect from 1989 in direction of making the market rates more flexible and market accustomed. This endeavors kicked up with **Narsimham (1991)** process of economic liberalization.

1990-91 was the time period that witnessed a dismal history of balance of payment crisis and liquidity built-up caused by high order of monetary growth giving fire to inflationary conditions. The superfluous structure of interest rates breeding uncertainty called for rationalization of the existing interest rate arrangement to spread tractability. Thus a ***restrictive cum higher interest rate policy*** was superintended where bank rates were raised to 12 per cent in 1991 to which linked lending and deposit interest rates also revised upwards. Yet, term deposits and bank

[23] Interest rates freedom to fix interest rates on deposits of maturity less than a year w.e.f. April 1985

advances over 2 lakhs were given freedom to determine rates keeping in perception the inflation, cost of and return on funds and customer status with the introduction of caps and floors respectively.

The financial sector reforms which gradually took pace, in the financial year 1993-94, the RBI took to ***deregulated interest rate policy*** in an atmosphere of reduced CRR and SLR and frequent changes in floor and ceiling rates.

The third year of banking reforms undertaking ***rationalisation*** showcased a consequential part of the financial sector reforms. The minimum lending rates (MLR) for credit limit over 2 lakh were abolished and Scheduled commercial banks were liberated to fix their Prime Lending rates (PLR)[24]. Lending and deposit rates of all cooperative banks excluding primary cooperative banks were totally deregulated in October 1994 subject to Minimum Lending Rate of 12 per cent. in the direction of ***further deregulation of interest rates*** major reforms were brought about in the deposit side where SCBs were allowed to fix their own interest rate on domestic term deposits over 2 years maturity while for those maturity of less than 30 days with the ceiling of 11 per cent.

With effect from 1997, ***bank rate acted as a reference rate*** for the entire financial system. A one percentage point fall in bank rate in April, June and October 1997 signaled the beginning of a low interest rate regime as it saw a consecutive fall in lending and deposit rates. The financial years ranging from 1996-97 to 2001-02 stood defined as an improvement.

- Softening of interest rate in a handsome manner.
- An improved liquidity condition
- Restraint inflation situation despite supply side pressures.

Even after a significant decline in interest rates, the descend was pronounced in the shorter-end and a ***conspicuous downwards rigidity at the longer end***[25].

[2424] Minimum rates charged by banks from borrowers for credit

[25] October 1999 Mid-Term Review of the Monetary and Credit Policy

But with the continued efforts towards liquidity amplifying measure, it shows signs of higher responsiveness of the general long term interest rates in all maturity spectrum of financial market.[26] Sticking to the objective of raising flexibility in context of softening of interest rate regime with the aim to meet credit growth and support revival of investment demand also increased the movement in market interest rates along with the growth in the markets as a whole.[27]

SECTION 2

Methodology

Real Time Series (TS) displays a variety of dynamics, i.e., Auto Correlation Function (ACF). A particular process say MA(1) allows for fairly restrictive pattern of ACF. By allowing for considering for all the patterns of processes AR, MA, ARMA or ARIMA, we increase the chance to find one that can fit the ACF of real TS.

We have to find the best combination of Data Generating Process (DGP) type and parameters coefficient that correctly or perfectly determines the ACF and that best matches the SACF (sample auto correlation function) and data stationarity properties. We will find different pattern of DGP which gives the smallest residuals variance (largest R-square)/ smallest residuals traded off against the number of parameters.

Del Negre and Schorfheide (2011) state that at first glance, VARs appear to be straightforward multivariate generalization of univariate AR models but a close look bears out that it is the key empirical tool in modern macroeconomics.

VARs are fundamentally simple models, i.e., multivariate linear time series model designed to capture the joint dynamics of multiple time series. A VAR framework is a set of linear dynamics equation where each variable is specified as a function of an equal number of lags of itself and other variables in the system. It treats all variable as jointly endogenous **(Enders, 1995)**. It treats each endogenous variable in the system as a function of lagged values of all endogenous variables. Introduced in 1972 by Chris Sims Critique 'Macroeconomic Reality', it criticized the large scale

[26] RBI Annual Report (1999-2000)
[27] RBI Annual Report (2000-01)

macroeconomic models as they impose strong restrictions as well as largely inconsistent with the notion that the economic agents takes the factors of their choices on tomorrow's utility into account. This method endures minimum restrictions to bring out how monetary policy shocks impacts the economy, accepting the inescapable simultaneity of monetary variables. Moreover, in a developing country like India, which experiences continuous process of progression due to ongoing reforms, the feat of analyzing the response of economic agents to monetary signals and its decent assessment becomes a daunting task. As conceded by **Christiano, Eichenbaum and Evans (1999)** and **Leeper, Sims and Zha (1996), Christiano, Eichenbaum and Evans (1994),** central banks faces serious challenge of distinguishing the outcome of RBI (India's case) from the one that the policy signals reacts to, i.e., to figure out the exogenous variable. The VAR model carries out such task.

Uses:

Forecasting

- Reduced-form VARs: As opposed to structural VARs, the residuals are not orthogonal; cannot be interpreted as structural shocks.

Structural Analysis

- Structural VARs: Used to investigate the response to shocks.

SECTION 3

Objectives

- To examine whether the relationship between short term money market with policy rates is significant.
- To test whether the relationship between weighted average call money rate and all the policy rates is a long run or not.

SECTION 4

Nature of Data Set

Table 4.1: Data Set of the Variables

	Log Call Rate	Bank Rate	CRR	SLR
Mean	2.306431	10.37436	11.90385	33.69103
Median	2.302585	10.00000	11.00000	37.00000
Maximum	3.563600	12.00000	15.00000	38.50000
Minimum	0.198851	7.000000	8.000000	25.00000
Std. Dev.	0.425395	1.381341	2.571413	5.165843
Skewness	-0.144114	-0.342068	0.106409	-0.754808
Kurtosis	6.399904	2.311466	1.303912	1.996778
Jarque-Bera	94.59469	7.654742	23.74131	26.69381
Probability	0.000000	0.021767	0.000007	0.000002
Observations	195	195	195	195

Data Source: RBI Handbook of Statistics on Indian Economy, Weekly Statistical Supplements

Table 4.1 clearly demonstrates the disposition of the data series. Converging over the value of skewness, all the variables (dependent and independent) are negatively skewed but closer to zero (normally distributed about the mean) value, implying a normal skewness.

Now if we stress over the value of kurtosis, except dependent variable, all the independent variables have lower values with kurtosis less than 3. The callrate is leptokurtic which has a peaked curve with higher values as seen in the table while the regressors' bank rate, CRR and SLR are platykurtic in nature with less than 3 kurtosis value.

Jarque-bera[28] statistics

[28] The difference of the skewness and kurtosis of the series with those from the normal distribution.

- The null hypothesis: the distribution is normal.
- Alternate hypothesis: non-normal distribution

The p-value of all the variables is significant and thus rejects the NH. The distributions are non-normal. A small probability value leads to the rejection of the H_0 of a normal distribution.

We specify the following equation to investigate the effects of RBI's decision making on financial market's weighted average call money rate.

$$Callratet = \beta 0 + \beta 1\, Bankratet + \beta 2\, CRRt + \beta 3\, SLRt + Ut \ldots\ldots (1)$$

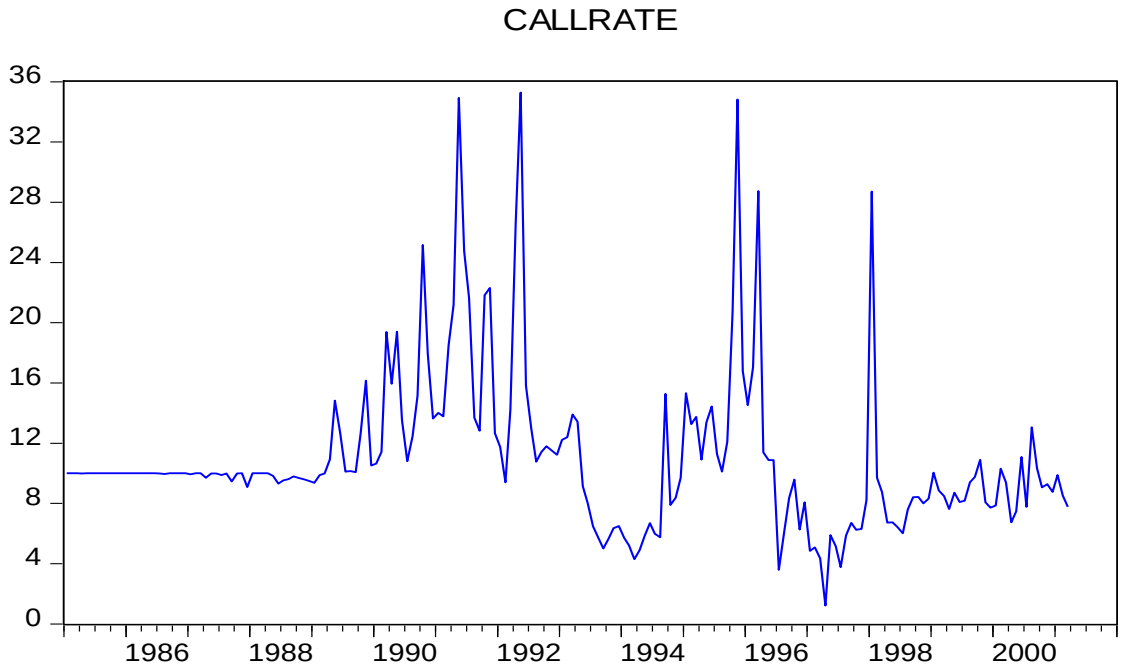
Parameters β_0, β_1, β_2 and β_3 are long run elasticities of call rate with respect to Bank rate, Cash Reserve Ratio and Statutory Liquidity Ratio, respectively.

$$\Delta callrate_t = \beta_0 \sum_{i=1}^{q} \beta_{1i}\, \Delta callrate_{t-i} + \sum_{i=1}^{q} \beta_{2i}\, \Delta bankrate_{t-i} + \sum_{i=1}^{q} \beta_{3i}\, \Delta CRR_{t-i} + \sum_{i=1}^{q} \beta_{4i}\, \Delta SLR_{t-i} + \beta_5 callrate_{t-1} + \beta_6 bankrate_{t-1} + \beta_6 CRR_{t-1} + \beta_6 SLR_{t-1} + U_t \ldots\ldots\ldots\ldots (2)$$

Where Δ is the First Difference Operator, q is the optimal lag length, β_0, β_1, β_3 and β_4, represents short run dynamics of the model and β_5, β_6, β_7 and β_8 represents long run elasticities. Figure 1 shows the plotting of the datasets.

Figure 4.1

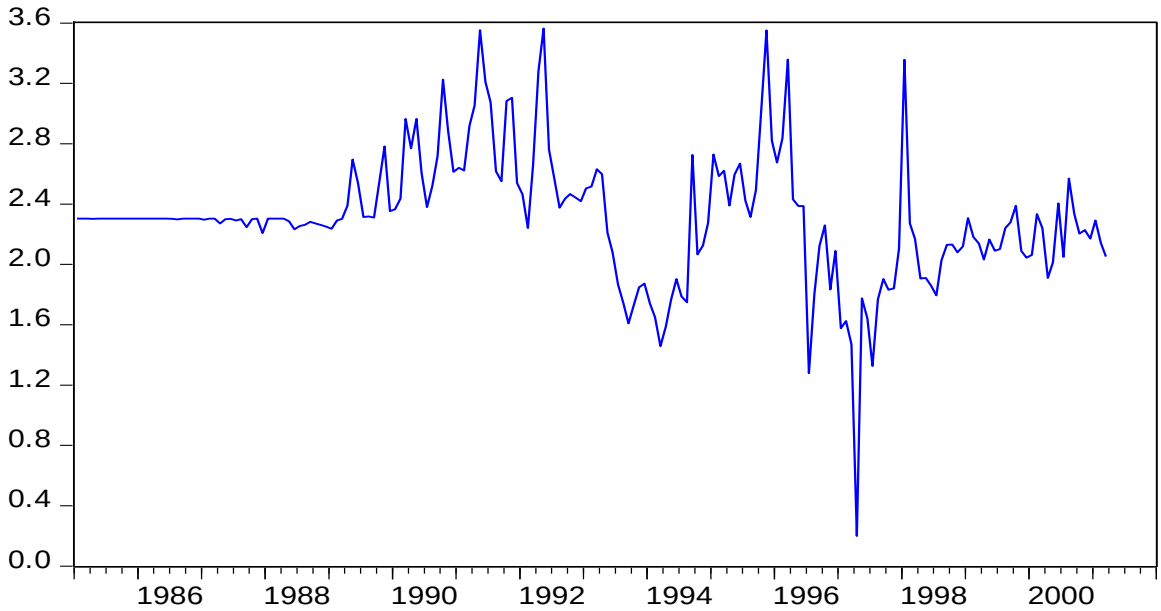
Trends of Call Money Rate



The data set also shows signs of non-normality. We attempted a log of the values to improve the dataset. Figure 4.2 shows the log version of the dataset.

Figure 4.2

Log of Call Money Rate



4.1 Outliers[29]

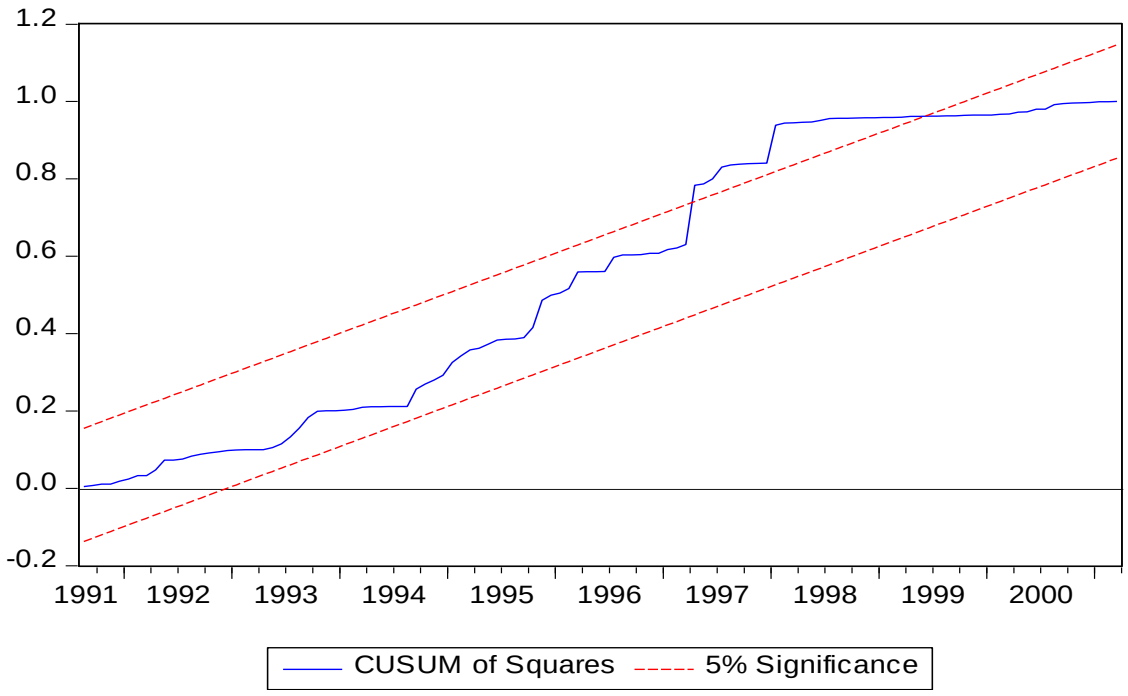
The graphs 4.1 and 4.2 clearly substantiates that there are breaks in the data set. And as we know the outliers can sabotage the results. Therefore, we need to cope up with the issue otherwise we may get a spurious regression results. Here comes to forefront the term structural break.

To tackle this upshot, an endogenous detection method is used in the study.

4.2 Preliminary Test

The figure 4.3 is tested form of evidence of some structural breaks in the chosen period presented through CUSUM test.

Figure 4.3



[29]When an event has affected the trend of a particular series, or a movement in particular series is distorted or truncated or when there is a visible difference between the past and future movements in a particular series, that change is considered a structural break.

4.3 Testing for Structural Breaks

The results of the Bai-Perron Multiple Breaks test are presented in the table 4.2 below.

Table 4.2: Structural Breaks by Bai-Perron Test

Model				
Criteria	**Relevant Statistic**	**Statistic Value/ Critical Value**	**No. Of breaks**	**Years of breaks**
L+1 vs. L sequentially	Sequential F-Stat	29.6651/9.8883	3	1995M10 1991M04 1998M03
Quandt Andrews	Max LR-F statistic	9.8883*** (0.000)	1	1995M10
	Max Wald F-statistic	29.6651*** (0.000)	1	1995M10

For this model, both the Quandt Andrews Breakpoint Test and the Sequential Criteria suggests one and three breaks respectively. **The model has been worked with 1998M03.** This is the only break whose dummy which introduced brought conspicuous stability and uniformity in the data. Therefore, the break and the dummy have been introduced for the same. The other break dates has not been incorporated.

The Chow test is also run to check whether the break date of 1998M03 to 1999M10 is significant or not.

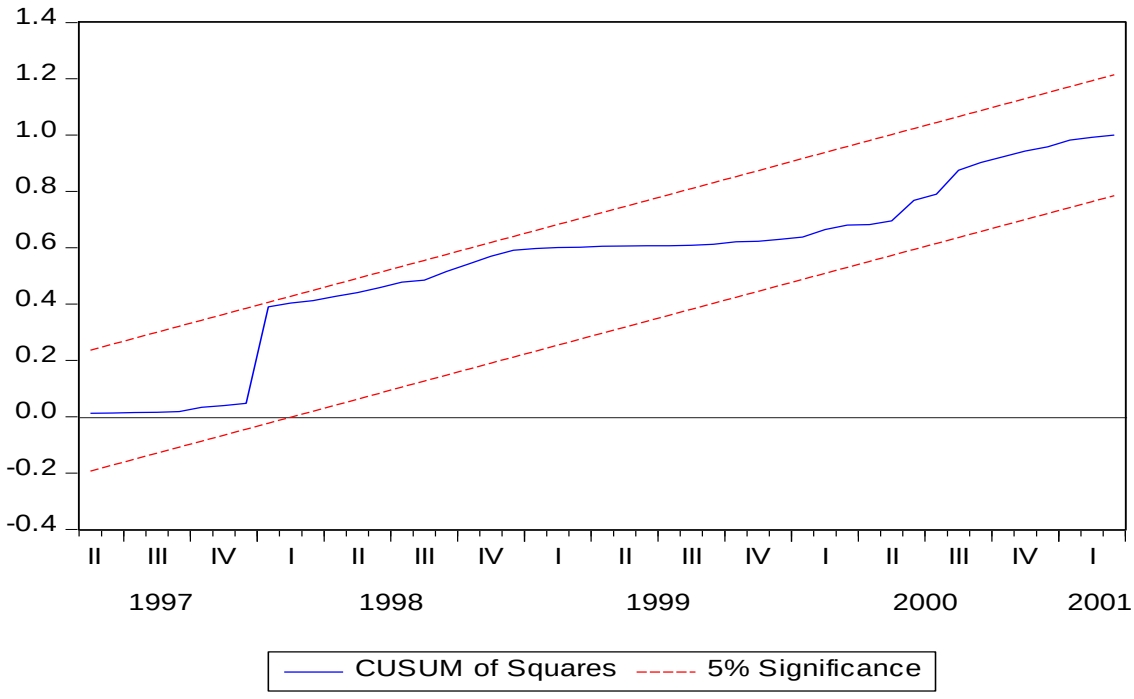
Table 4.3: Chow Test Results

Model	Break Date	F-Value
Model	1991M04	3.1176** (0.0273)
	1995M10	9.8883*** (0.0000)
	1998M03	6.7902** (0.05007)

*** represents result to be significant at 1%, 5% and 10%.

The F-value stands significant at 1% for 1995M10 and at 5% for 1991M04 and 1998M03. This intimates the presence of structural break for the selected time series. This was the time period post the revival from the economic crisis faced by India and the precipitation of the outgrowth exhibited from India's Economic Liberalisation. This change has altogether brought about an offset of License Raj and ease in the business of the financial market in the Indian Economy.

Figure 4.4



4.4 Testing for Unit Roots (Augmented Dickey Fuller Test)

Before testing whether any cointegration exists between call rate and other regressors, the standard ADF test is applied to check for the order of integration of variables in table 4.4 below.

Table 4.4: Results of Augmented Dickey Fuller Test

Variables	Critical Values at 1 per cent level of significance	Augmented Dickey Fuller Test (At level)	Augmented Dickey Fuller Test (At first difference)
LnCallrate	-3.464	-5.547	-
Bankrate	-3.464	-0.259	-13.249
CRR	-3.464	-0.704	-12.637
SLR	-3.464	0.203	13.372
Dummy	-3.462	-0.831	-14.212
Dumbankrate	-3.464	-1.293	-13.787
DumCRR	-3.464	-1.400	-13.734
DumSLR	-3.464	-1.067	-13.863

* and ** show significance level at 1 percent and at 5 percent levels, respectively

An analysis of the Table 4.4 proves that we clearly fail to reject the hypothesis of unit root for both trend and intercept for all the independent variables except the dependent variable, i.e., call rate which is stationary at level.

All the non-stationary variables becomes stationary I(0) at first difference at either 1% or 5% level of significance. Callrate is stationary while Bank rate, CRR and SLR are found to be non-stationary both with intercept and Trend and Intercept.

Henceforth, the results shows that none of the variables are I(2), which is imperative condition for ARDL modeling. We also ascertain that the variables are a mix of I(0) and I(1), to which ARD stands to be suitable for assessing the long-run co-integration.

4.5 Maximum Lag Selection

The maximum dependent and dynamic regressors lag limit according to Schwarz Bayesian Criteria for monthly samples data is chosen 1. The table 4.5 shows the optimal lag both for dependent and independent variables.

Table 4.5: Maximum Lag Selection

Variables	No. Of Lags (4,2,0,0,2,0,0)
Call rate	1
Bank rate	1
CRR	1
SLR	1

4.6 ARDL Specification Results

Bound Test Approaches to Co-integration:

The F-statistics in the table postulates for the model that the statistics crosses the upper bound of the critical values as referred by Pesaran et al. (2001). This assertion thereby rejects the null hypothesis of no cointegration in the model. **This enfolds that there exists a long run relationship among the variables in the concerned model.**

Table 4.6: Result of Bound Test

ARDL Model **Model: Callrate = f(Bankrate, CRR, SLR)**		
Model	**F-statistics**	**K**
Callrate(1985M3-2001M4)	3.503521	6
Critical Values	Upper Bound (1)	Lower Bound(0)
10% level	2.94	1.99
5% level	3.28	2.27
1% level	3.61	2.55
K represents number of independent factors		

4.7 Order of Lag

Table 4.7: F-Statistics for testing the existence of Long-Run Relationship

Order of lag	F-statistics
1	16.934

The lower and upper bound for F-Statistics is taken from the table 4.6: Unrestricted intercept and no trend given in Pesaran (2001).

We use SBC to select optimal lag length of variables included in the ARDL model. Table 4.8 below presents the results of the long run relationship of the selected ARDL model (4,2,0,0,2,0,0).

SECTION 5

Results for the Estimated Long run Coefficients

After validating the evidence of long run relationship with the Bound Test, we carry on to settle for the Estimated Long-run results.

5.1 Long run Model Specification

$$Callratet = a01 + b11callratet - i + b21\, bankratet - i + b31crrt - i + b41crrt - i + b51dummy1t - i + b61dumbankratet - i + b61dumcrrt - i + b71dumslrt - i + e1t \dots\dots\dots\dots (3)$$

Table 4.8: Long Run Model

Dependent Variable ΔCallrate, ARDL(4,2,0,0,2,0,0) Model based on Schwarz Bayesian Criteria				
Regressor	**Coefficient**	**Standard Error**	**t-Ratio**	**p-value**
LnCallrate	0.569727	0.072636	7.843623	0.0000
Bankrate	3.993804	1.318882	3.028174	0.0028
CRR	0.737213	1.594068	0.462473	0.6443
SLR	-0.366058	0.648750	-0.564251	0.5733
Dumbankrate	-1.721979	0.948181	-1.816086	0.0711
DumCRR	-0.151200	1.608358	-0.094009	0.9252
DumSLR	0.411471	0.646391	0.636566	0.5252

* and ** show significance level at 1% and 5% level, respectively.

The long run co-integration relation can be traced in the form of the following equation:

$$Callrate = (0.569)Callrate *** + (3.99)Bankrate ** * + (0.737)CRR - (0.366)SLR - (1.721)Dumbankrate * - (0.151)DumCRR + (0.422)DumSLR \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

According to the long-run results, in the model, Bankrate and CRR realize a direct relationship while SLR shares an indirect relation with the weighted average call money rate. Only bank rate partakes a significant relationship with the dependent variable.

The positive coefficient values of bank rate intend an increase in bank rate in respect to an increase in the money market interest rates. The Bank rate seems to exert the highest impact over the financial market rates as compared to other policy rates.

5.2 Error Correction Term

Error Correction Model Specification:

$$a_0 + \sum_{i=1}^{p} a_{1i} \Delta \text{callrate}_{t-1} + \sum_{i=1}^{q} a_{2i} \Delta \text{bankrate}_{t-1} + \sum_{i=1}^{q} a_{3i} \Delta \text{crr}_{t-1} + \sum_{i=1}^{q} a_{4i} \Delta \text{slr}_{t-1} + + \sum_{i=1}^{q} a_{5i} \Delta \text{dummy1}_{t-1} + \sum_{i=1}^{q} a_{6i} \Delta \text{dumbankrate}_{t-1} + \sum_{i=1}^{q} a_{7i} \Delta \text{dumcrr}_{t-1} \sum_{i=1}^{q} a_{8i} \Delta \text{dumslr}_{t-1} + \lambda \text{ECT}_{t-1} \ldots\ldots\ldots\ldots (5)$$

Table 4.9: Error Correction representation of the selected ARDL model

	Coefficient	**Standard Error**	**T-ratio**	**(Prob)**
CointEq(-1)	-0.392180	0.072647	-5.398419	0.0000

For the study period, the equilibrium correction coefficient is -0.3921 for the model. **The ECT is both negative and less than one and so is also significant at 1 per cent.** As shown in the table 4.9, 39.21 per cent of disequilibria from previous period converge back to the long run equilibrium in the current period.

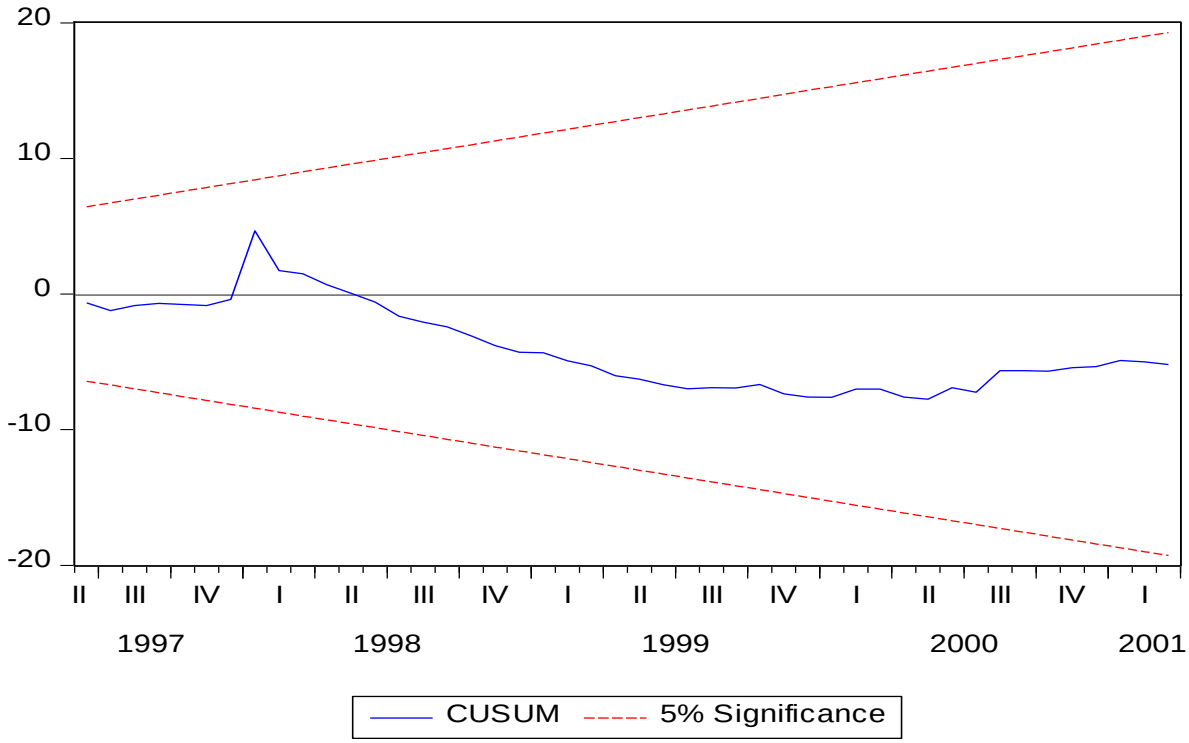
The disequilibrium is corrected in 54.58 months to converge back to equipoise.

Table 4.10: Diagnostic Tests

Table : Diagnostic Tests			
	Model		
Diagnostic Tests	**F-stat**	**Prob. value**	**R-square**
Serial Correlation	0.9937	0.372	0.762
Heteroskedasticity	**Breusch-Pagan-Godfrey**		
	F-Stat	**Prob. value**	**R-square**
	4.8463***	0.000	0.567

The robustness of the estimated model has been tested by various diagnostic tests such as serial correlation, Heteroscadasticity test and CUSUM stability test. In the model there is no serial correlation found[30]. The model stands stable as shown in the CUSUM graph.

Figure 4.5



[30] According to Breusch-Godfrey Serial Correlation LM Test.

Long-run Pass-through to WACMR from the policy rates (repo rate) during 2001-2017

Table 4.11: WACMR and Bank rate: Long Run VECM result

	WACMR (1985-2001)
Bank Rate	***3.993***
Observations	***193***
Pass-through elasticity (Bank rate)	***17.96***
Mean of Dependent variable	***2.3064***
Standard Errors in parenthesis ***p<0.01 **p<0.05 *p<0.1	

The above table 4.11 substantiates the cointegrating vector between dependent variable and the independent variable -0.3921. This cinches from looking over the adjustment parameters and the long run coefficients, when there is a departure from the equilibrium between WACMR and RBI's Bank Rates, the WACMR adjust 39.21% each month towards the policy rates to re-establish equilibrium. Table 4.11 reports a 17.96 of long-run elasticity of WACMR with respect to bank rate. Thus, bank rate insures to sufficiently capturing better the monetary policy stance of RBI.

SECTION 6

CONCLUSION

From the above discourse about error correction term being 0.3921, it would take 18.19 quarters months for WACMR to fully respond to the change in bank rates, thus consummating 100 percent of the pass-through.

There is a long run relationship between money market instrument chosen and the policy rates decided by the monetary authorities. The medium term monetary policy operating tool has the highest impact on influencing the response speed of the financial markets in relation to other administrative tool adopted in the regime then.

CHAPTER 5

EMPIRICAL EVIDENCE OF MONETARY POLICY TRANSMISSION FROM POLICY RATES TO WACMR: POST-NEW MONETARY POLICY REGIME

INTRODUCTION

This study documents the second part of the research that pivots on the testing of the efficaciousness of the new monetary regime adopted by India's apex bank. It partakes as the follow up to the last chapter aimed at testing the monetary policy transmission mechanism in the post LAF period marking a drastic shift in the way monetary decisions were targeted and signaling focused on.

Plan of the Work

This chapter is framed in the ensuing manner. In Section 1, we intended to give a prelude to the working in the new regime from direct quantity based to indirect price based monitoring. Then the Section 2 aspires to give a brief literature. In Section 3, objectives are defined. The econometric specification and modeling is capsuled in Section 4. The analytical derivation and its inferences have been presented in Section 5. Lastly, Section 6 concludes the comparative study.

SECTION 1

Background

Back since 1990s, the monetary policy passage of governance was through monetary targeting, one which led to stress under the burgeoning interaction of market constituents in an interest rates post deregulations setting. It also accounts the grappling scenario of liquidity surplus spawn by capital inflows transfusing into hyped up burden over the money supply. A conspicuous validation of implicit changes in the transmission mechanism of monetary policy was also addressed in the report of third working group on Money supply.[31] It was the interest and exchange rate which was boosted viz. quantity variables, as more and more pricing decisions were shifted to the market forces to decide. This eventually led to an onwards shift to

[31] The Third Working Group in Money Supply. June 1998 (Chairman: Dr. Y.V. Reddy)

a more broad-based multiple indicator approach. Posterior to emergence of Liquidity Adjustment facility (LAF) in 2001, RBI switched to the use of Repo rate as its monetary policy instrument rather than monetary aggregates. Weighted average Call money rates (WACMR), the interbank borrowing rate, was supposed to stay within the LAF band of overnight liquidity interspersion and absorption through Repo and Reverse Repo rate respectively. WACMR make good the short- term borrowing needs, keeping up with liquidity, thus contributing towards maintenance of equilibrium between demand and supply of short term funds. Such instrument poised the funds available to those willing to lend and those inclined to borrow. Since this chapter focuses on 2001-2017 data time series, it is when the operations of LAF were progressive and bringing about changes in the transmission channels of monetary policy. Hereafter, as the LAF cropped up as the chief tool in monetary policy operating framework, it also surfaced certain notional and practical concerns which need to be dealt in improving of the potency of monetary business. The enlisted issues in the 2003 report of RBI[32] are mooted by the working group. In retrospect, the LAF structure in track of recent development in financial market across cross-country experiences in both liquidity deficit and surplus status, where India saw conditions of liquidity redundancy (The Mid-Term Review of Monetary and Credit Policy for 2003-04).

As for grounded by the second internal group about the new monetary handling protocol[33], the bank rate fluctuations along with CRR and repo rates, materialized as significant drive in liquidity intendance. Whilst the medium term standing of policy was mirrored by Bank rates, the LAF took care of the quotidian liquidity stances.

The case of India here is esoteric especially after 2011 when RBI turned over to from quantity to rate signals. The accounted transmission lags have undergone the influence of structural changes in real sector and financial innovations in lieu of heightened volatility in international economy.[34] Again the period highlights the significant switch from monetary targeting framework to multiple-indictor approach.

[32] Report of the internal group on Liquidity adjustment Facility, 2003
[33] Announced in April 2001
[34] Asian Crisis 2008

RBI credits to believe that transmission works better with liquidity in deficit mode.[35] Therefore, here, to study the behavior of market interest rates led by changes in the policy rates, I single out Repo Rate as a proxy to policy rate.

Following are the few of the recommendations under review of the new current operating monetary policy regime announced by RBI:[36]

1. The liquidity adjustment facility (LAF) with plus or minus revision to be the key building block in the operating framework of the RBI.

2. The revamped LAF should run in a deficit liquidity mode and the liquidity level should be held around +/- one per cent of net demand and time liabilities (NDTL) of banks for optimal monetary transmission.

3. The repo rate should be the single policy rate to unequivocally flag the standing of monetary policy to achieve macro-economic objectives of growth with price stability. It will operate within LAF corridor. As the repo rate changes, the Bank Rate and the reverse repo rate should change automatically.

4. The RBI at its discernment could conduct contemporaneous auctions for longer period for purely liquidity management rather than for motioning the policy rate.

5. The reverse repo rate will have a negative spread on the repo rate and it will be the rate at which the RBI will sustain liquidity under the LAF. The reverse repo rate will constitute the lower bound of the corridor.

6. The optimal width of the policy corridor be fixed at 150 basis points and should not be changed in the normal circumstance. The corridor should be asymmetric with the spread between the policy repo rates and reverse repo rate twice as much as the spread between the repo rate and the Bank Rate. With a corridor of 150 basis points, the Bank Rate could be fixed at repo rate plus 50 basis points and the reverse repo rate at repo rate minus 100 basis points.

[35] RBI 2011

[36]The review of the Working Group of the operating procedure of monetary policy in India (Chairman: Shri Deepak Mohanty) in first quarter review of Monetary policy 2010-2011.

7. The weighted average overnight call money rate to be the operating target of the RBI. The operating objective should be to contain this rate around the repo rate within the corridor.

8. The Reserve Bank should conduct the second LAF (SLAF) on a regular basis.

SECTION 2

Literature Review

The Indian repo market preeminently befits well as a monetary policy instrument to influence the interest rate channel for two main implementations, i.e., moderating the liquidity in the money markets and insuring fair signaling of markets. It started as a pure OTC market which revolutionized into an online repo dealing system by Clearing Corporation of India (CCIL) shifting into a true price discovery. It is composed of three segments: RBI daily fixed repo, Market Repo and Collateralised Borrowing and Lending Obligations (CBLO). Both by absorbing the surfeit liquidity and injecting the insufficiency in the banking system, repo and reverse repo both point to both assistance and resistance level for money market funds under LAF system. Repo aids in number of benefactions:

I. Features low credit risks for they are collateralized.
II. Repos are flexible and can be customized by RBI tallying the liquidity conditions.
III. More distant outreach of RBI to wide facets of institutions.
IV. Better denoting of market credit risk/stress by ascertaining the call rate and market repo spread.
V. The momentous system till date to guarantee proper liquidity conservation.

While there are various works focusing largely on transmission to the real sector using structural VAR framework, there isn't much probation around the first node of transmission to financial market rates. **Goyal** in his 2017 paper clinches that since post LAF, financial rates moves with policy rates, giving assent to the outreach of first leg of monetary policy transmission.

Kanagasabapathy et al. in his 2014 paper worked out to sample test the study of interplay and favorability between rates and quantity channels in India by attempting granger causality between the contended variables under a VAR model framework. They encountered that repo rates came out more effective in adjusting short run market rates such a call rates and G-secs instead of long run market rates which further hinges on factors like output gaps or economic activity etc.

RBI (2011) report brought forth through an international perceiving that transmission is better, i.e., money market instruments are increasingly more reactive when liquidity situation of a country is in deficit mode. Moreover, due to liquidity shocks from foreign inflows, a daily accurate liquidity market prognostication is difficult and hence RBI modified LAF into deficit mode. The 2017 Monetary policy report narrates the sustained movement between WACMR and repo rate under a stable financial market condition and persistent surplus liquidity conditions post GST implementation and remonetization.

Ashima Goyal and **Deepak Kumar Agarwal** in their paper "Monetary transmission in India: Working of price and quantum channels" using simple OLS regression probed comparative rendition of price and quantity channels in Indian Monetary policy transmission. They found Repo rate as the most impressive medium to influence money markets and thus interest rate channel to be efficacious and attaining dominion. But the measure of an elevated impact of Repo rate alludes to the quantity channel having an indirect impact. They also refute RBI practice to hold WACMR as the intermediate target instrument along with the recommendations that transmission is quick in a deficit mode.

2.1 Interest Rate Policy Regime

The interest rate regime during this time period was aimed to curb inflationary expectations and stable inflation conditions. Emphasizing over the need to bring nominal rate of interest in consonance with the decline in the rate of inflation, during 2001-02, RBI continued imparting ***elasticity to interest regime*** with bias towards ***softer interest rate*** such that rate framework align with behavior of domestic economic activity and international financial conditions. These ***pull ins*** was taken to

reach for the stable inflationary expectations which in turn depended on price stability.

2002-04 was the period of ***soft and flexible interest rate policy*** for the sake of revival of investment. The regime put to use Bank rates, CRR and repo as significant tool of liquidity and monetary management in a nonabrasive inflation condition. Bank rate was reduced to 6.00 per cent in April 2003, total to 500 bps in 1997-2002, lowest since independence and CRR from 4.74 to 4.5 in 2003[37]. The lending rates demonstrated rigidity highlighted in maximum spread over the PLR for all advances.

In order to enhance transparency, a Benchmark Prime Lending Rate (BPLR) was advocated for banks, which RBI advised to announce, taking into account their actual cost of funds, operating expenses and a minimum margin to cover regulatory environment. System of tenor linked PLR was discontinued. The BPLRs of 5 major banks were lowered by 25 to 50 basis points in December 2004 as compared to the rates prevailing a year ago[38]. One noticeable development was the sub-PLR lending by the commercial banks on a large scale. With sub-PLR lending and reduction in maximum spread over PLR, lending rates effectively softened during the year.

2005-06 to 2007-08; High interest rate regime

Over all the stance to pursue and environment is conducive to price stability and maintain of momentum of growth.

To contain inflationary expectation and tighten liquidity raised Reverse Repo Rate and Repo Rate and used ***CRR as a major policy instrument*** (Annual Report 2007-08) and modifying them in line with the changing scenario.

2008-09 to 2011-12; Restricted cum expansionary regime

Under the backdrop of global financial and eco crisis challenges, MP underwent shift from monetary tightening to monetary easing by the second half of 2008-09 aimed to stimulate faster recovery in growth by enabling credit expansion at viable rates along

[37] Economic Survey (2003-04)
[38] Economic Survey (2004-05)

with credit quality preservation. (Economic Survey 2009-10). Easy credit availability was the crucial component of the overall policy response as the most overbearing concern was the weak transmission of policy rates to lending rates and deceleration of credit growth.

The following are the unsettling issues of the regime:

- "Administered interest rate structure on small saving deposits.
- Structural asymmetry faced by banks in fixing interest rate.
- Practice of giving advances at below Benchmark Prime Lending Rate (BPLR)"

In order to improve the credit lending and interest rate channels of MP transmission mechanism and convey clarity in loan process, RBI introduced a ***new system of Base rate*** in July 2010; replacing BPLR (RBI Annual Report 2009-10)

In 2010-11, RBI withdrew from accommodative Policy stance and resorted to ***tight Monetary Policy*** as inflation remained sticky on the back of new pressures. The RBI raised the policy rates six times during the current fiscal year wherein the repo rate under its LAF was increased by 175 basis points and the reverse repo rate was increased by 225 basis points. CRR was at 6 per cent of net demand and time liabilities of banks. Monetary transmission improved considerably in the latter half of 2010-11 after sustained tight liquidity, and prompted banks to raise deposit and lending rate (RBI Annual Report, 2010-11).

SECTION 3

Objectives

- The study aspires to examine the strength and limit of pass-through following the change in level and direction of repo rates in influencing ceiling of changes in market rates of interest.
- To test whether the regressors (WACMR) and regressand (Repo rate and Reverse Repo rate) share a significant long-run with each other.

SECTION 4

Nature of Datasets

Table 5.1: Data set of the variables

	Callrate	Repo rate	Reverse Repo rate
Mean	1.819157	7.081217	5.703704
Median	1.902108	7.250000	6.000000
Maximum	2.644045	9.000000	7.500000
Minimum	-0.314711	4.750000	3.250000
Std. Dev.	0.328435	1.077640	1.073824
Skewness	-1.857358	-0.511920	-0.653540
Kurtosis	11.48695	2.436619	2.813958
Jarque-Bera	675.8906	10.75445	13.72666
Probability	0.000000	0.004621	0.001045
Observations	189	189	189

Source: RBI's Annual report, Weekly Statistical Supplement, Handbook of Statistics on Indian Economy

Table 5.1 clearly demonstrates the disposition of the data series. Converging over the value of skewness; the regressand variables have is negatively skewed, implying long left tail about the mean and the regressors closer to normal distribution though negative.

Now if we stress over the value of kurtosis, except dependent variable all the independent variables has an almost normal distribution with kurtosis close to 3. The call rate has a peaked curve with higher values as seen in the table.

SECTION 5

Empirical Analysis

This chapter reckons to be the other end of the maneuver to gauge out the complete state of the interest rate pass-though robustness in Indian contexture. As the last

chapter dispels well about the pre-new operating policy regime, this current study delves into the 2000M1-2017M3 time period upshots.

We specify the following equation to investigate the effects of RBI's decision making on financial market's weighted average call money rate.

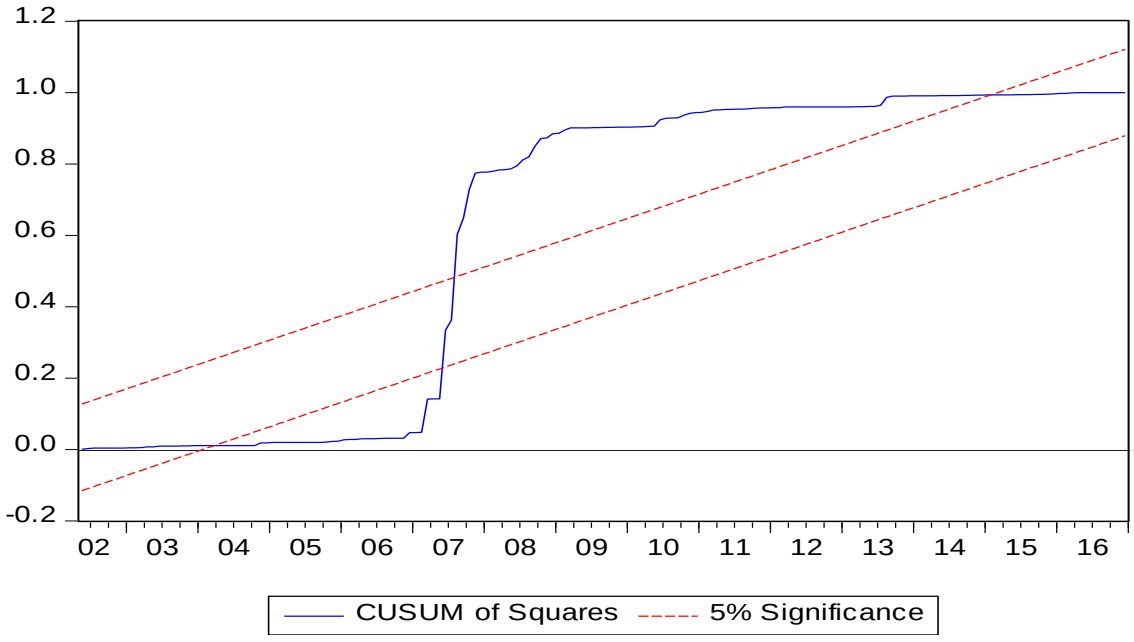
$$Callratet = \beta 0 + \beta 1\, Reporatet + \beta 2\, Revreporatet + Ut \ldots\ldots (1)$$

Parameters β_0, β_1 and β_2 are long run elasticities of call rate with respect to Repo rate and Reverse Repo rate respectively.

$$\Delta callrate_t =$$
$$\beta_0 \sum_{i=1}^{q} \beta_{1i}\, \Delta callrate_{t-i} + \sum_{i=1}^{q} \beta_{2i}\, \Delta repo_{t-i} + \sum_{i=1}^{q} \beta_{3i}\, \Delta revrepo_{t-i} +$$
$$\beta_4 callrate_{t-1} + \beta_5 repo_{t-1} + \beta_6 revrepo_{t-1} + U_t \ldots\ldots\ldots\ldots (2)$$

5.1 Outliers:

Figure 5.1



The graphs 5.1 clearly substantiates that there are breaks in the data set. And as we know the outliers can sabotage the results. Therefore, we need to cope up with the issue otherwise we may get a spurious regression results. Here comes to forefront the term structural break.

When an event has affected the trend of a particular series, or a movement in particular series is distorted or truncated or when there is a visible difference between the past and future movements in a particular series, that change is considered a structural break.

To tackle this upshot, an endogenous detection method is used in the study.

5.2 Preliminary Test

Testing for Structural Breaks:

The results of the Bai-Perron Multiple Breaks test are presented in the Table 5.2 below.

Table 5.2: Structural Breaks

Model				
Criteria	**Relevant Statistic**	**Statistic Value/ Critical Value**	**No. Of breaks**	**Years of breaks**
Global Information	Schwarz Criterion	-	1	2008M06
	LWZ criterion	-	0	-
L+1 vs. L sequentially	Sequential F-Stat	31.044/11.47	1	2008M06
Quandt Andrews	Max LR-F statistic	15.5221*** (0.000)	1	2008M06
	Max Wald F-statistic	31.0441*** (0.000)	1	2008M06
Global L vs. None	UD stat/ critical value	31.044/11.70	1	2008M06
	WD stat/ critical value	31.326/12.81	4	2004M11 2007M5 2010M06 2014M09

For this model, both the Global Information Criteria and the Sequential Criteria suggests one breaks and both are the same. **The model has been worked with 2008M06 (as this period concur with the global financial crisis)** to 2015M06 and the break and the dummy has been introduced for the same. The other break dates has not been incorporated.

The Chow test is also run to check whether the break date chosen is significant or not. [39]

Figure 5.2

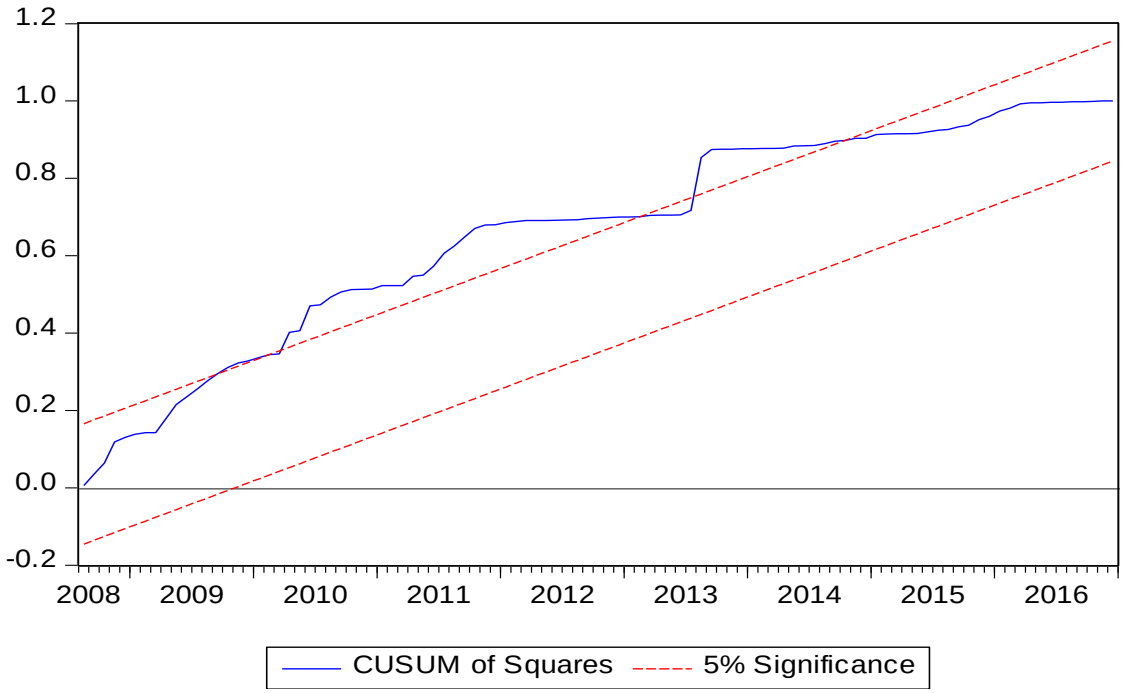


Table 5.3: Chow Test

Model	Break Date	F-Value
Model	2008M06	15.5221*** (0.000)
	2015M06	11.672** (0.039)

*** represents result to be significant at 1%, 5% and 10%.

[39] Chow test is applied in case of exogenous detection when the break is known. After finding the break date with Bai-Perron Test.

5.3 Testing for Unit Roots (Augmented Dickey Fuller Test)

Before testing whether any cointegration exist between callrate and other regressors, the standard ADF test is applied to check the order of integration of variablesin table 5.4.

Table 5.4: Results of Augmented Dickey Fuller Test

Variables	Critical Values at 1 per cent level of significance	Augmented Dickey Fuller Test (At level)	Augmented Dickey Fuller Test (At first difference)
Callrate	-3.465	-4.015	-
Repo rate	-3.465	-2.311	-9.962
Reverse Repo rate	-3.465	-1.700	-9.761
Dummy	-3.465	-1.010	-13.638
Dumrepo	-3.465	0.9211	-13.379
Dumrevrepo	-3.465	0.7467	-13.020

An analysis of the Table 5.4 proves that we clearly fail to reject the hypothesis of unit root for both trend and intercept for all the independent variables except the dependent variable, i.e., call rate which is stationary at level.

All the non-stationary variables becomes stationary I(0) at first difference at either 1% or 5% level of significance.

Henceforth, the results shows that none of the variables are I(2), which is imperative condition for ARDL modeling. We also ascertain that the variables are a mix of I(0) and I(1), to which ARDL stands to be suitable for assessing the long-run co-integration.

5.4 Maximum Lag Selection

The maximum dependent and dynamic regressors lag limit according to Schwarz Bayesian Criteria for monthly samples data is chosen 2. The table 5.5 shows the optimal lag both for dependent and independent variables.

Table 5.5: Optimum Lag Selection

Variables	No. Of Lags (4,0,0,0,0)
Callrate	1
LnReporate	2
LnRevreporate	2
Dumlnrepo	1
Dumlnrevrepo	1

5.5 ARDL Specification Results

Table 5.6: Dependent Variable ΔCallrate, ARDL(4,0,0,0,0) Model M based on Schwarz Bayesian Criteria

Regressor	Coefficient	Standard Error	t-Ratio	p-value
Callrate(-1)	0.599864	0.073454	8.166528	0.0000
Callrate(-2)	-0.243188	0.085819	-2.833731	0.0051
Callrate(-3)	0.085167	0.085707	0.993701	0.3217
Callrate(-4)	-0.172989	0.066643	-2.595763	0.0102
LnRepo rate	0.508133	0.255772	1.986664	0.0485
LnReverse Repo rate	0.462295	0.201824	2.290585	0.0232
Dumlnrepo(-1)	-0.554066	0.247235	-2.241050	0.0263
Dumlnrevrepo(-1)	0.579688	0.277112	2.091891	0.0379

5.6 Bound Test Approaches to Co-integration

The F-statistics in the table postulates for the model that the statistics crosses the upper bound of the critical values as referred by **Pesaran et al. (2001).** This assertion thereby rejects the null hypothesis of no co-integration in the model. This enfolds that there exists a long run relationship among the variables in the concerned model.

Table 5.7: Result of Bound Test

ARDL Model Model: Callrate = f(Repo rate, Reverse Repo Rate)		
Model	**F-statistics**	**K**
Callrate(2001M3-2017M4)	13.611	4
Critical Values	Upper Bound (1)	Lower Bound(0)
10% level	3.09	2.2
5% level	3.49	2.56
1% level	4.37	3.29
K represents number of independent factors		

5.7 Order of Lag

Table 5.8: F-Statistics for testing the existence of Long-Run Relationship

Order of lag	F-statistics
2	13.611

The lower and upper bound for F-Statistics is taken from the table 5.7: Unrestricted intercept and no trend given in **Pesaran (2001).**

We use SBC to select optimal lag length of variables included in the ARDL model. Table below 28 presents the results of the long run relationship of the selected ARDL model (1,1,0,0,0)

Results for the estimated Long run Coefficients:

After validating the evidence of long run relationship with the Bound Test, we carry on to settle for the Estimated Long-run results.

Long run model specification

$$Callratet = a01 + b11callratet - i + b21\,repot - i + b31revrepo + b41dummt - i + b51dumrepot - i + b61dumrevrepot - i + e1t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Table 5.9: Long run model

Dependent Variable ΔCallrate, ECM(4,0,0,0,0) Model M based on Schwarz Bayesian Criteria				
Regressor	Coefficient	Standard Error	t-Ratio	p-value
Callrate(-1)	-0.40245**	0.189464	-2.124191	0.0351
LnRepo rate	-0.731146***	0.081179	-9.006633	0.0000
LnReverse Repo rate	0.508133**	0.255772	1.986664	0.0485
Dumlnrepo(-1)	0.462295**	0.201824	2.290585	0.0232
Dumlnrevrepo(-1)	-0.554066**	0.247235	-2.241050	0.0263

*** and ** show significance level at 1% and 5% level respectively.

With the taking up of the restricted constant and no trend specification, following is the long run co-integration relation traced in the form of the following equation:

$$\begin{aligned} \boldsymbol{Callrate} = & -(\mathbf{0.4024})\boldsymbol{Callrate}_{***} -(\mathbf{0.7311})\boldsymbol{LnReporate}_{*} \\ & *\ +(\mathbf{0.5081})\boldsymbol{Revrepo}_{**} +(\mathbf{0.4622})\boldsymbol{Dumrepo}_{*} \\ & *\ -(\mathbf{0.5540})\boldsymbol{Dumrevrepo}_{**} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (\mathbf{4}) \end{aligned}$$

According to the long-run results, in the model, Repo rate and Reverse Repo rate realize a direct relationship with the weighted average call money rate. But the relationship of Repo rate is insignificant while that of the Reverse Repo rate is significant at 1% level of significance. The dummy variables are positive and significant.

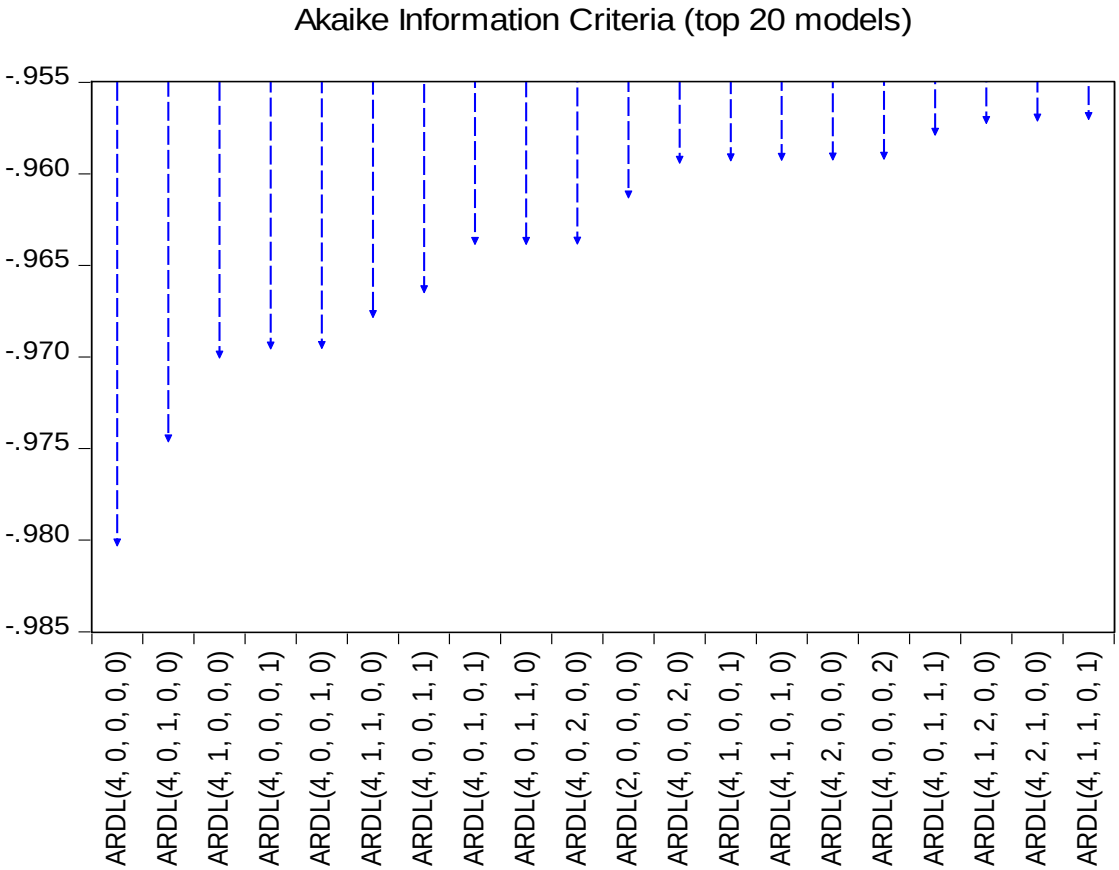
The positive coefficient values of both the regressors intend an increase in weighted average call money in respect to an increase in policy rates. This result is as per the expectation.

The Reverse repo rate seems to exert the highest impact over the financial market rates as compared to repo rates.

The Dummy for repo agreements is negative and significant implying the mild but adverse of global financial crisis, the intercept values of repo rates falls by an approx 0.3 units due to the worldwide commotion. Contrary are the dummy results of reverse

repo rates which got incremental to the financial crisis by an approx 0.3 units as sufficiently captured by the dummies for the month 2008M06.

Figure 5.3



5.8 Error Correction Term

Now Error Correction Model Specification:

$$a_0 + \sum_{i=1}^{p} a_{1i} \Delta \text{callrate}_{t-1} + \sum_{i=1}^{q} a_{2i} \Delta \text{repo}_{t-1} + \sum_{i=1}^{q} a_{2i} \Delta \text{repo}_{t-2} + \sum_{i=1}^{q} a_{3i} \Delta \text{revrepo}_{t-1} + \sum_{i=1}^{q} a_{3i} \Delta \text{revrepo}_{t-2} + \sum_{i=1}^{q} a_{4i} \Delta \text{dumm}_{t-1} + \sum_{i=1}^{q} a_{5i} \Delta \text{dumrepoo}_{t-1} + \sum_{i=1}^{q} a_{6i} \Delta \text{dumrevrepo}_{t-1} + \lambda \text{ECT}_{t-1} + e_t \quad \text{.....(5)}$$

Table 5.10: Error Correction representation of the selected ARDL model

	Coefficient	Standard Error	T-ratio	(Prob)
CointEq(-1)	-0.73114***	0.079779	-9.164636	0.0000

For the study period, the equilibrium correction coefficient is -0.7311 for the model. **The ECT is both negative and less than one and so is also significant at 1 per cent.** As shown in the table 5.10, 73.11 per cent of disequilibria from previous period converge back to the long run equilibrium in the current period.

The disequilibrium of repo rate and reverse repo rate is corrected in 2.85 months and 2.3 months to converge back to equipoise respectively.

5.9 Diagnostic Tests

The robustness of the estimated model has been tested by various diagnostic tests such as serial correlation, Heteroscedasticity test and CUSUM stability test. In the model there is no serial correlation found[40]. The model stands stable as shown in the CUSUM graph.

Table 5.11: Diagnostic Tests

	Model		
Diagnostic Tests	**F-stat**	**Prob. value**	**R-square**
Serial Correlation	0.42239	0.6562	0.655
Heteroskedasticity	**Breusch-Pagan-Godfrey**		
	9.30983***	0.000	0.345

[40] According to Breusch-Godfrey Serial Correlation LM Test.

SECTION 6

Long-run Pass-through to WACMR from the policy rates (repo rate) during 2001-2017

Table 5.12: WACMR and Repo rate: Long Run VECM result

	WACMR (2001-2017)
Repo Rate	***-0.73114***
Reverse Repo Rate	***0.50813***
Observations	***189***
Pass-through elasticity (Repo rate)	***2.845***
Pass-through elasticity (Reverse Repo rate)	***1.5929***
Mean of Dependent variable	***1.8191***
Standard Errors in parenthesis ***p<0.01 **p<0.05 *p<0.1	

The above Table 5.12 substantiates the cointegrating vector between dependent variable and the independent variable -0.73114. This cinches from looking over the adjustment parameters and the coefficients when there is a departure from the equilibrium between WACMR and RBI's repo rates, the WACMR adjust 73.114% each month towards the policy rates to re-establish equilibrium. Table 31 reports a 2.845% of long-run elasticity of WACMR with respect to repo rate and 1.592% with respect to reverse repo rate. Thus, reverse repo rate insures sufficient capturing to better the monetary policy stance of RBI.

From the above discourse about error correction term being 0.7311, it would take 2.851 months and 2.3 months for WACMR to fully respond to the change in policy rates, thus consummating 100 percent of the pass-through.

SECTION 7

Conclusion

This study marked the analogy between the operational standing of the Monetary policy pre and post LAF adherence in discourse of changes in the MPTMs. Subsequent to 1990s, the way of monetary policy precedence by RBI became worrisome with the underlying interference of market forces following the deregulation. The LAF empowers RBI to temper short-term variations in liquidity thus insuring and assuring a stable call money market, viscous to the monetary policy objectives, through fastening up with interest rates and bank reserves diurnal administration.

Though the time until 2009 surfaced double digit growth acceleration, the reason behind the situation can be pressed upon the ocean of vulnerabilities that swept the economy famously termed as "taper tantrum" and "fragile five" in the summer of 2013. Being the headmost economy to rebound from the Global Financial Crisis by easing liquidity, the RBI set free liquidity potential equal to 10% of GDP with 425 basis points cumulative cut to keep floating the financial institutions functional. But in the guise of high growth, the food prices were rearing their ugly head. Time period between 2009-12 CPI-IW observed 10.4% while WPI- 7.4%. The wholesale price index failed to detect[41] the surging food inflation where WPI non-food manufactured products inflation close to zero yet Inflation expectation crossing 12%. The rate of inflation divulges not just the rate of increase in price levels but also the quality of governance and macro-economic management of the state[42]. People were pulling their money out of financial assets and directed them into gold buying in a country where only 2% of the gold demand is mined domestically. This dramatic season (2009-12) saw gold constituting 11% of the total imports and CAD reaching to 6.8%.

[41] The wholesale price index (WPI), the official metric for measuring inflation
[42] BIS Central bankers speeches, 2017

This complicated condition also led to frantically exiting foreign capital out of EMEs, investors fleeing assuming the riskiness of the assets and losing faith over the infamous economies under the moniker "fragile five"[43]. The adverse effects of inflation vented in more than a single way and what started off as food inflation eventually metamorphosed a balance of payment crisis. This called for an unannounced demand for a reform in the year 2013. This new monetary regime did not work out because of the above mentioned turmoil by the late 2013. To counter attack, this year experienced yet another shift in the monetary regime in striving with the recommendations of the Expert Committee guiding a new pursuit, operating procedure, transmission and international dimensions[44]. By January 2015, a new all India Consumer Price Index was constructed with 2012 as its base (headline CPI inflation) so that the RBI can now react well to the CPI figures. This time period ranging from 2001 to 2016 saw off-the-kilter innovations brought about monetarily, thus the comparatively lengthy lag in submission to the policy decisions post new monetary policy regime stands correct.

[43] Brazil, Indonesia, Turkey, South Africa and India

[44] Expert Committee to Revise and Strengthen the Monetary Policy Framework

CHAPTER 6

LAST LEG OF CREDIT LENDING CHANNEL: MONETARY TRANSMISSION TO THE BANK INTEREST RATES

INTRODUCTION

As is the propensity of an emerging world economy, India has, to an extent, a large public banking sector which accounts for nearly 73 per cent of the total banking asset system. Moreover, Indian financial system is bank-centric with a remarkably comprehensive share of total financial assets and a close interaction with other components of the financial system. As solicited in the textbooks and at a general level, it is perceived that banks play a trivial role in monetary policy transmission. But burgeoned works of Bernanke, Blinder, Wilcox, Stein and et al. have raked considerable immersion in the literature and over the relevance of the credit channel in monetary policy transmission mechanism. So much so that the financial constraints on banks cripple their capability to neutralize hostile innovation on deposits with optional financing elements and it generates supply side effects in the credit market and encourages economic uncertain fluctuations.

This study will contest the extent and variability of credit market behavior in response to shock tend by RBI monetary policy since the mid 1990s which heralds the era of financial liberalization, merger & acquisitions. It is to impugn over the persisting differences in the sensitivity of loan and deposit which thrust towards the economy's investment and consumption. Additionally, there is some corroboration regarding that the degree of adjustment and the speed of adjustment of interest rates are higher in the post new regime period. This suggests a compounded plus accelerating confluence towards an integrated and more homogeneous market. For it is of special interest both from the vista of banking theory and from a monetary policy point of view, I elect the time series ranging from January 1999 to March 2017.

Plan of the Work

This chapter is configured in the following manner: In Section 1, we focus on the culmination of the pass through of monetary policy. The operation and role of the

subject matter are described in the following Section 2. Then the objectives are delimited in Section 3. The econometric verifiability and data analysis have been provided in Section 4. The empirical results calculated results derived and their dialogue is shown in Section 5. Finally, the conclusion drawn from the study is slated in Section 6.

SECTION 1

Background

This chapter compounds the whole monetary transmission into its last leg around the ultimate reach to the objectives of stable inflation and growth. The entire process starts from altering in the policy rate by central bank to the inter-bank lending rate, to bank deposits rates, to closing down to bank lending rates as the last knot, ultimately, terminating its impact on inflation and growth. A productive transmission mechanism rides on how the policy change strikes the addressing of the households and firm.

An establishment like commercial bank chiefly weighs on mobilizing deposits and offering loans viewed as input and output activities of banks respectively. Synchronously, acquiring and utilizing of funds has causal impacts on one another accredit through various banking literature. **Dermine** in his 1986 paper confirmed interdependence of loans and deposits when banks face likely chances of repayment nonfeasance analogous to **Kashyap (2002**) paper approving correlation among the two.

Pass-through from WACMR to bank lending rates:

When central bank revises its policy rates, it has an expected varying effect over the banks' cost of funds, prompting remodeling of rates of both, which commercial banks pays to depositors and demands from borrowers. When RBI reduces the repo rates, it intends to stimulate economy's aggregate demand and anticipate a consecutive lowering of market rates along with a fall in the banks' lending interest rates and hence augmented output. This expectedness transcend to the final attainment of the economy's objective of maintaining stable prices to meet the targeted growth is what RBI rides upon under its trade off of raising and diminishing policy rates. This

adequate monetary policy transmission remains a key policy concern for the Reserve bank.

Epoch Characteristics:

This time duration not only witnessed the Global financial crisis but also some of the domestic upheavals as well. It was also in the same time period when the Monetary Policy Committee came into force (27th June, 2016), US Presidential elections held which stampeded capital flows out of the EMEs, thus depreciating currency around the world. The MPC vouched a domestic dilemma of trade-off between inflation and growth. An accommodative monetary policy cycle adopted since 2015 to veer up economic growth underwent reductions in policy rates to a cumulative of 150 basis points. But then the macroeconomy and liquidity conditions suffered another shift of event. The economy saw an abrupt invigorating vegetable prices, pulse prices and food prices evident in the CPI readings forming a vortex. The amped up hope of better monsoon, business sanguineness encouraged MPC to further reduce policy rates to a cumulative of 175 bps suggesting such off-the-kilter course.

This was further revved up by the November 2016's withdrawal of 87% of outstanding stock of currency in circulation. Demonetization again revamped the monetary policy stance in the backdrop of the unfolding transitory effects of demonetization in face of compressing demand, disrupting cash-intensive segments of market, forcible selling of perishables, etc., which instigated a premature action on the part of RBI in the schema shift from accommodative to neutral monetary policy regime. This stratagem of renewing the allegiance from inflation targeting to narrowing down the LAF corridor to +/- 25 bps, secures a prime alignment of WACMR with the policy rates. Likewise by the late 2017, when the withdrawn currency were retreating back, the banks experienced subsequent flooding of deposits and mushrooming of idle reserves followed by money movement through financial markets pulling down interest rates, yield rates and asset prices. In correction, Incremental Cash reserve Ratio (ICRR) of 100% of relevant demand and time liabilities of banks was employed.

SECTION 2

Review of Literature

Akin to the works of **Bernanke and Blinder (1988)** and **Bernanke, Gertler and Gilchrist (2000),** this chapter exudes to the one of the propagations that RBI uses to affect economic workings. It is the credit channel sorted into two forms: The broad credit channel[45] and the bank lending channel. The study in vicinity is concentrated on the latter one. The channel runs on the assumption that there are bank-dependent borrowers. The other is that deposits are less than perfect substitutes and thus brings pressure on the amounts of deposits and spring up the shift supply schedule of bank credit. This culminates the Monetary Policy Transmission mechanism[46].

The Indian Banking Industry has some idiosyncratic features:

There is an existential company of public sector banks in financial intermediation. The topmost scheduled commercial bank for FY17 is a public sector bank, i.e., State bank of India with the total income Rs 2,109,791.7 million[47], second leading amongst the highest net profit and highest CASA ratio of 44.6 % (based on the respective banks annual reports, financial statements and information provided by RBI). Moreover, 7 out of 10 top banks constitute the public-sector banks **(Standalone, 2017).**

In as much as post deregulations in the early 1990's, the country has witnessed incessant reforms and innovations in RBI's trying its hand in bringing improvement in the speed and extent of setting lending interest rate by banks apart from transfusing transparency and tractability to banks. The ongoing structural changes in banking have eloquently altered the role of banks in the MPTMs which it appears is unclear as of how an interpretation of the historical data will help in judging future business cycle variability. And, it is a sizable interest of the policymakers to decipher how the

[45] The channel through which Monetary policy affects the balance-sheet of lenders and borrowers in the economy.
[46] Kashyap and Stein (1994), Kasyap and et al. (2000).
[47] India's Top Banks 2017, Dun & Bradstreet, Secondary Sources like RBI, IMF, World Bank and IBA.

alterations in ways of banking dislocate their ability to regulate and forecast business cycles.

Thus, the role of credit is highly consequential in monetary transmission held in two distinguished phenomenon- credit channel and financial accelerator. These concepts were missing in the standard neoclassical models but both are supplemental and propagative of the money view portrayed in the textbooks. The credit channel accentuates the importance of bank lending, highlights the imperfections of capital market and bank-dependent borrowers. These accounting emphasize the real consequences of monetary policy on banks competence to lend.

In the inchoative period, since 1994, Prime Lending rates (PLR) was employed to set lending rates which were offered to credit worthy and large organizations. This was transited to Benchmark Prime Lending rates (BPLR) in 2003 as a single reference rate for all the other rates to be proposed to big customers (prime) by all banks keeping in check the profit margin and transparency. All the banks were allowed to have their own BPLR and PLR. PLR took into account the cost of funds, operational costs, minimum margin to cover regulatory requirements (reserves, contingency and capital charge), and profit margin. But PLR fell short of fulfilling its conscious objective to bringing transparency and sufficing as the reference rate for pricing of loan products, for a large part of the lending taking place at interest rates below the announced BPLRs[48]. Ergo, in July 2003 the PLR was replaced by Base rate with the expectation of better transmission mechanism. Base rate is the minimum lending rate below which no bank can lend with the actual lending rate obligated from the borrowers being the base rate plus borrower-specific charge or spread. It was to ensure that changes in interest policy rate get effectively transferred to bank customers. But the base rate too did not work as assumed in real. The flexibility agreed to banks in deciding the average or marginal cost of funds induced opacity among banks which then started adopting various methods in calculating their cost of funds.

Besides, banks often conformed to the spread over the base rate to benefit the new borrowers while leaving the transmission wasted for existing borrowers. This

[48] Cross-subsidization

spawned an overshadowed appraisal of speed and force of transmission. Thereupon, to plead against the languid and inflexible transmission under base rates, effective from 2016 and yet running, RBI issued guidelines for setting lending rates for banks under the moniker Marginal Cost of Funds based Lending Rates (MCLR) system. The MCLR takes into account the *marginal* cost of funds dissimilar to base rate[49] awaited to be more sensitive to policy rates. This endeavor towards an improved, transparent, flexible and tenacious signaling of monetary policy is eschewed under the validation of RBI's recent report.[50]

SECTION 3

Objectives

The bank lending channel is a special case of the broad credit channel for its corners with supply of bank load as the only source of external financing in MPTMs. Here, I have made use of monthly (high frequency) disaggregated time series data to ravel out supply from demand shocks.

- This study aims to catechize the pass-through of market interest rates to various bank interest rates in Indian perspective.
- To fine whether the relationship between dependent and independent variables are significantly long run or a short run.

[49] Under base rate system, banks had the discretion to choose between average or marginal cost of funds.

[50]Report of the Internal Study Group to Review the Working of the Marginal Cost of Funds Based Lending Rate System (Chairman: Dr. Janak Raj)

SECTION 4

Nature of Dataset

Table 6.1: Data set of the variables

	WACMR	DEPOSIT RATE	BASE RATE
Mean	6.763105	7.872717	10.94692
Median	6.880000	8.250000	10.75000
Maximum	14.07000	10.25000	13.87500
Minimum	0.730000	5.375000	7.750000
Std. Dev.	1.919398	1.237240	1.223192
Skewness	0.138746	-0.558728	0.111387
Kurtosis	3.837751	2.139973	2.981608
Jarque-Bera	7.106810	18.14375	0.455941
Probability	0.028627	0.000115	0.796148
Observations	219	219	219

Source: RBI's Basic Statistical Returns of Scheduled Commercial Banks in India

Table 6.1 clearly demonstrates the disposition of the data series. Converging over the value of skewness; the regressand and the regressor variables have is normally skewed; implying normal distribution about the mean though the deposit rate is negative.

Now if we stress over the value of kurtosis, except dependent variable (leptokurtic) all the independent variables away from kurtosis value 3. The call rate has a peaked curve with higher values while deposit rate is platykuric as seen in the table.

4.1 Empirical Thoroughfare

We specify the following equation to investigate the effects of RBI's decision making on financial market's weighted average call money rate.

$$Callratet = \beta 0 + \beta 1\, depositratet + \beta 2\, WACMRt + Ut \ldots\ldots..(1)$$

Parameters β_0, β_1 and β_2 are long run elasticities of call rate with respect to deposit rate and weighted average call money rate respectively.

$$\Delta baserate_t = \sum_{i=1}^{q} \beta_{1i}\, \Delta baserate_{t-i} + \sum_{i=1}^{q} \beta_{2i}\, \Delta WACMR_{t-i} + \sum_{i=1}^{q} \beta_{3i}\, \Delta depositrate_{t-i} + \beta_4 baserate_{t-1} + \beta_5 WACMR_{t-1} + \beta_6 depositrate_{t-1} + U_t \ldots\ldots\ldots (2)$$

4.2 Outliers:

The graphs clearly substantiates there are breaks in the data set. And, as we know the outliers can sabotage the results, therefore, we need to cope up with the issue otherwise we may get a spurious regression results. Here comes to forefront the term structural break.

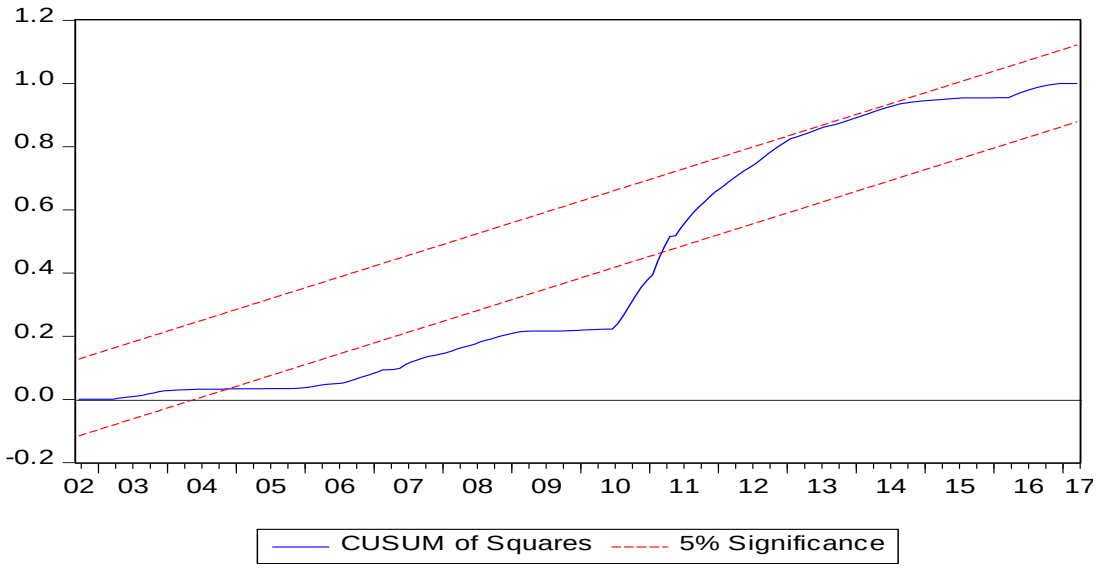
When an event has affected the trend of a particular series, or a movement in particular series is distorted or truncated or when there is a visible difference between the past and future movements in a particular series, that change is considered a structural break.

To tackle this upshot, an endogenous detection method is used in the study.

4.3 Preliminary Test:

Testing for Structural Breaks:

Figure 6.1



The results of the Bai-Perron Multiple Breaks test are presented in the table 6.2 below.

Table 6.2: Structural Breaks

Model				
Criteria	**Relevant Statistic**	**Statistic Value/ Critical Value**	**No. of Breaks**	**Years of Breaks**
Global Information	Schwarz Criterion		4	2010M7 2002M04, 2010M7 2002M9,2006M3,2010M7 2002M9,2006M3,2010M7, 2014M8
	LWZ criterion		3	2002M9,2006M3,2010M7,2014M8 2002M9, 2005M3, 2007M11 2010M7, 2014M8
L+1 vs. L sequentially	Sequential F-Stat	134.063/11.47	3	2010M7 2002M4 2006M3
Quandt Andrews	Max LR-F statistic	134.063		2010M7
	Max Wald F-statistic	268.127		
Global L vs. None	UD stat/ critical value	673.635/11.70	3	2010M7 2002M04, 2010M7 2002M9,2006M3,2010M7
	WD stat/ critical value	924.233/12.81	3	2002M9,2006M3,2010M7,2014M8 2002M9, 2005M3, 2007M11 2010M7, 2014M8

For this model, both the Global Information Criteria and the Sequential Criteria suggest one breaks and both are the same. **The model has been worked with**

2002M04 to 2010M07 (as this period concurs with the global financial crisis) and the break and the dummy has been introduced for the same. The other break dates has not been incorporated.

The Chow test is also run to check whether the break date of 2004M04 to 2010M07 is significant or not. [51]

Table 6.3: Chow Test

Model	Break Date	F-Value
Model	2002M04	9.672** (0.020)
	2010M07	11.123** (0.500)

*** represents result to be significant at 1%, 5% and 10% .

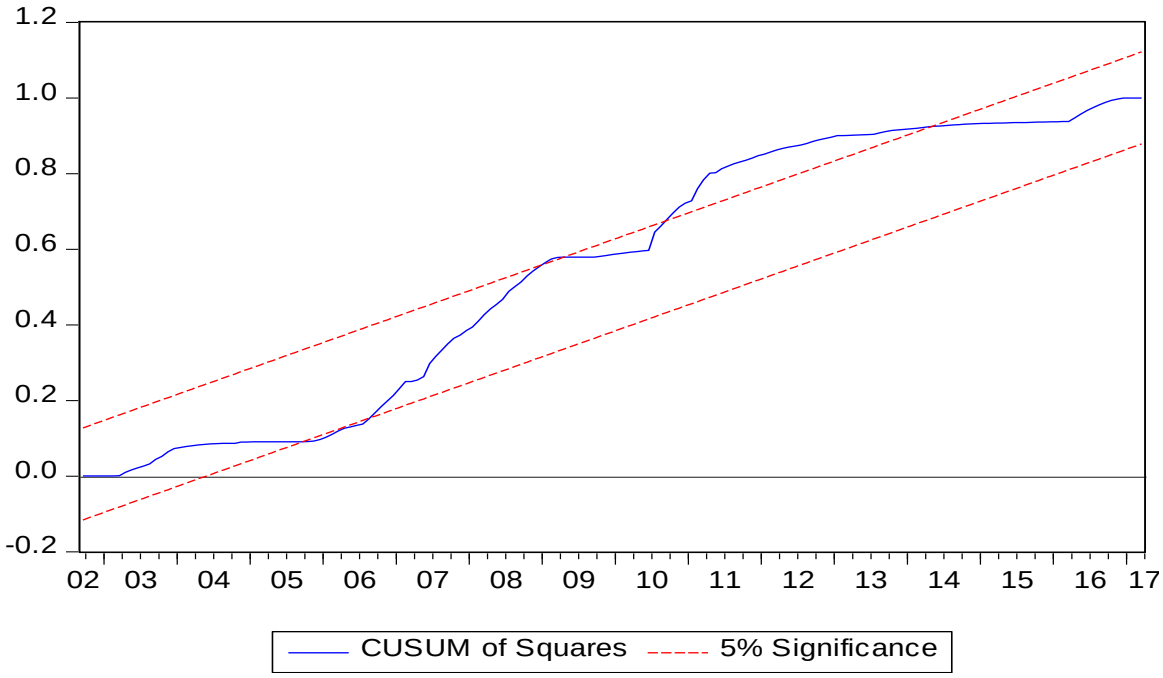


Figure 6.2

4.4 Testing for Unit Roots (Augmented Dickey Fuller Test):

Before testing whether any cointegration exist between callrate and other regressors, the standard ADF test is applied to check the order of integration of variables.

[51] Chow test is applied in case of exogenous detection when the break is known. After finding the break date with Bai-Perron Test.

Table 6.4: Results of Augmented Dickey Fuller Test

Variables	Critical Values at 1 per cent level of significance	Augmented Dickey Fuller Test (At level)	Augmented Dickey Fuller Test (At first difference)
Baserate	-3.4602	-2.3643	-13.3651
WACMR	-3.4604	-3.8049	-
Depositrate	-2.3011	-3.4603	-16.1175
DumWACMR	-3.4603	-1.0596	-15.3085
Dumdepositrate	-3.4603	-0.8238	-13.8771

An analysis of the Table 6.4 proves that we clearly fail to reject the hypothesis of unit root for both trend and interpret for all the independent variables except the dependent variable, i.e., call rate which is stationary at level.

All the non-stationary variables becomes stationary I(0) at first difference at either 1 % or 5% level of significance.

Henceforth, the results shows that none of the variables are I(2), which is imperative condition for ARDL modeling. We also ascertain that the variables are a mix of I(0) and I(1), to which ARD stands to be suitable for assessing the long-run co-integration.

4.5 Maximum Lag Selection:

The maximum dependent and dynamic regressors lag limit according to Schwarz Bayesian Criteria for monthly samples data is chosen 2. The table 6.5 shows the optimal lag both for dependent and independent variables.

Table 6.5: Optimum Lag Selection

Variables	No. Of Lags (1,2,1,1,1)
Baserate	1
WACMR	2
Depositrate	1
DumWACMR	1
Dumdepositrate	1

4.6 ARDL Specification Results:

Bound Test Approaches to Co-integration:

The F-statistics in the table postulates for the model that the statistics does not crosses the upper bound of the critical values as referred by **Pesaran et al. (2001)**. This assertion thereby fails to reject the null hypothesis of no cointegration in the model. **This enfolds that there exists no long run relationship among the variables in the concerned model.**

Table 6.6: Result of Bound Test

ARDL Model Model: Baserate = f(WACMR, depositrate)		
Model	**F-statistics**	**K**
Baserate (1999M2-2017M3)	1.0123	2
Critical Values	Upper Bound (1)	Lower Bound(0)
10% level	2.93	1.81
5% level	3.34	2.14
1% level	4.21	2.82
K represents number of independent factors		

4.7 Order of Lag:

Table 6.7: F-Statistics for testing the existence of Long-Run Relationship

Order of lag	F-statistics
2	1.0123

Table 6.8: Dependent Variable ∆Baserate, Selected ARDL(1,2,1,1,1) Model

Regressor	Coefficient	Standard Error	t-ratio	Prob-value
C	0.004853	0.020749	0.233896	0.8153
D(BASE_RATE(-1))	0.757627	0.197495	3.836180	0.0002
D(WACMR(-1))	0.049803	0.019415	2.565207	0.0110
D(WACMR(-2))	0.025755	0.018764	1.372571	0.1714
D(DEPOSIT_RATE(-1))	0.085144	0.135817	0.626905	0.5314
D(DUMMY1(-1))	1.458033	1.512949	0.963703	0.3363
D(DUMWACMR(-1))	-0.400928	0.081838	-4.899054	0.0000
D(DUMDEPOSIT_RATE (-1))	0.047368	0.159407	0.297153	0.7666

$$\begin{aligned}\boldsymbol{\Delta Baserate1} &= \mathbf{0.004} + (\mathbf{0.757})\boldsymbol{\Delta Baseratet-1}^{***} + (\mathbf{0.049})\boldsymbol{\Delta WACMRt}\\ &\quad \mathbf{-1}^{**} + (\mathbf{0.025})\boldsymbol{\Delta WACMR\, t-2} + (\mathbf{0.085})\boldsymbol{\Delta Depositratet-1}\\ &\quad - (\mathbf{0.4009})\boldsymbol{\Delta DummyWACMRt-1}\\ &\quad + (\mathbf{0.0473})\boldsymbol{\Delta DummyDepositratet-1}\\ &\quad + \boldsymbol{et}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(\mathbf{3})\end{aligned}$$

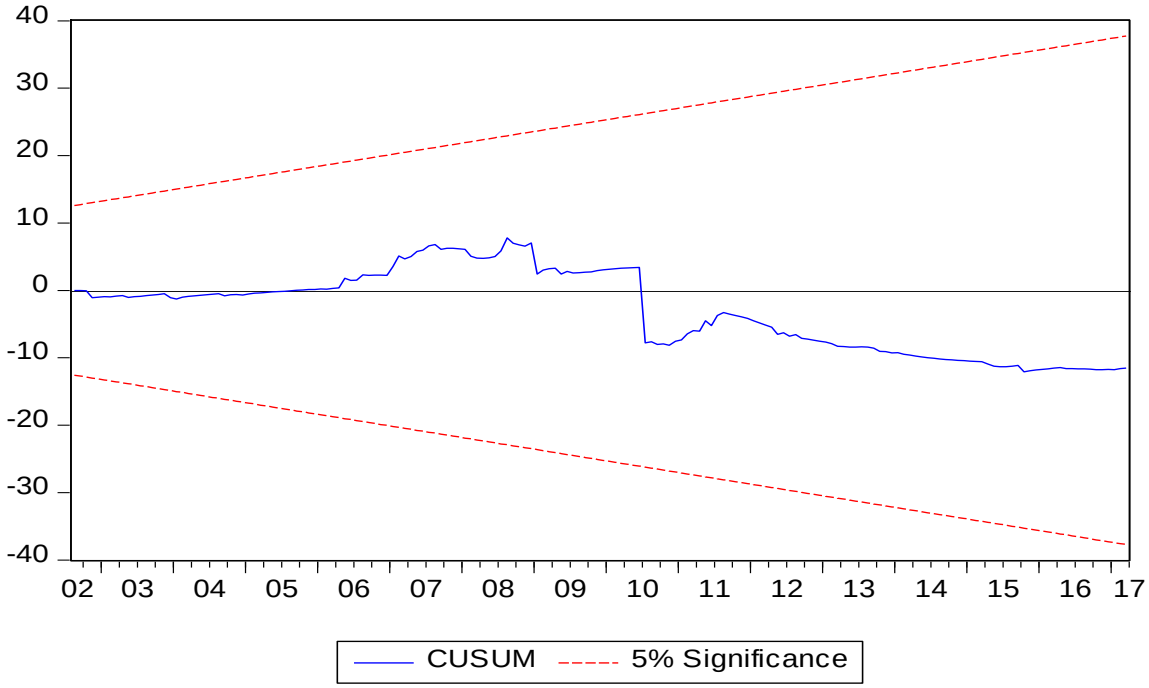
4.8 Diagnostic Tests:

The robustness of the estimated model has been tested by various diagnostic tests such as serial correlation, Heteroscadasticity test and CUSUM stability test in table 6.9. In the model there is no serial correlation found[52]. The model stands stable as shown in the CUSUM graph.

Table 6.9: Diagnostic Tests

	Model		
Diagnostic Tests	**F-stat**	Prob. Value	R-Square
Serial Correlation	0.2654**	0.0761	0.7671
Heteroskedasticity	**Breusch-Pagan-Godfrey**		
	0.9371***	0.005	0.3638

Figure 6.3



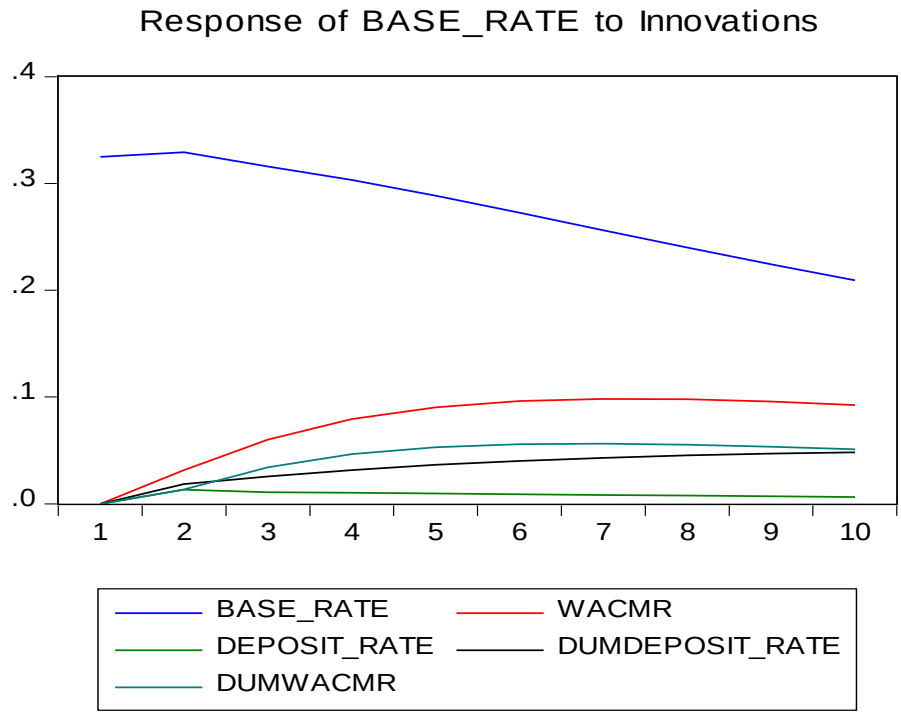
[52] According to Breusch-Godfrey Serial Correlation LM Test.

SECTION 5

Short-run Impulse

Figure 6.4

Response to Cholesky One S.D. (d.f. adjusted) Innovations



The short run response of base rate to one standard deviation is indirect to policy rates innovations. In the first period, no other variables than its lagged value of itself impacted up to 30 per cent of the dependent variable. These lagged variables of base rates gradually diminished with its effect up to 20 per cent by the end of tenth month. It was only after second month that the other regressors started affecting the base rate. Particularly, WACMR with an influence of just 3.1 per cent extending to maximum of 9.25 per cent, being the most significant factor in influencing among the rest of independent variable. Deposit rates have 0.6 per cent impact only by ten S.D.

SECTION 6

Conclusion

The bank's base rates maneuver to attain equilibrium after changes in the bank's deposit rates or in other words, the Error Correction term of bank's base rate to WACMR and deposit rates of top five scheduled commercial banks is -0.09 while there is no long-run relationship. Corollary to the figures, it follows that it takes 10.33 months for the independent variables to reach its 100% pass- through after it if affected by the changes in the Call money market rates and deposit rates.

The aim of the chapter is to estimate the pertinence of bank lending channel in India by watching over the monthly data corresponding to monetary policy instrument. The result corroborates the substantiation to support India's bank lending channel presence though not thoroughly but evidently and ostensibly. A refashioning of policy rate at the short end of the market, after a time lag, induces a corresponding dovetailing of the medium term interest rates. The inter linkage between the policy rate and resultant changes in other rates of interest is firmly established.

Banks peculiar innateness plays a significant role in their take to shocks for it convulses their ability to substitute away for deposits.[53] Moreover, different banks also serve distinguished clients. Large banks attend large corporations who have more elastic demand and better access to capital markets. Such firms can stake large banks, i.e., bring a loss to banks in market sharing to bond market in episodes of disincline credit concession in period of shock.

In general, investment and consumption decision entails demand for credit trails which does not reacts to monetary policy instantaneously. Unlikely to the former, banks' cost of funds upshots concurrently and this reflects in the basic interest rates, primarily for short maturity loans. And here, banks with disparate identifying abilities, move to and forth deposit non-cohesively. This courses different reactions to monetary policy, indicative of bank lending channel.

[53] Kashyap and Stein [1994], Kashyap et al. [2000] and Arena [2007].

CHAPTER 7

CONCLUSION AND POLICY IMPLICATIONS

Plan of the Work

This chapter encloses the deduction of the concerned research in the following fashion. It starts with the entailment of the main resultant account of analysis in Section 1 of this thesis. The Section 2 of the chapter put forward some policy implications that follow from the other results. The next section demonstrates the validation of the objectives chosen for the thesis thorough Research Hypothesis. Finally, Section 4 provides the limitations and extent of opportunity for future research.

SECTION 1

Main Comprehensive Findings

The study cumulatively entails to calibrate the credulity people can attach around the Monetary Policy Transmission Mechanism of India. It comes out with various idiosyncratic features with which monetary policy of India is affected and is suggestive of the last node of credit lending channel of transmission mechanism, circumscribed in a monetary environment. Amid the invariable financial and economic reforms, escalating global market integration across various segment of domestic financial market, increasing accessible market in the real time and onrush flow of information multiplier, there are presumptive changes in the confines and speed of behavior of target variables to RBI's policy signals. There is an unmistakable result of transmission lags summoning from monetary policy to the real sector.

First, remunerative of the thirty-two years long monthly data was delved into to decipher the pass-through from monetary policy rate to WACMR, sequestered into two time periods. This is in the light of the regime shift in the monetary policy operating procedure where the time periods are isolated into two halves askewing towards a focused study. Second, scanning a constellation of 18 year long time period ranging from 1999 to 2017, it seeks to examine the pass-through to bank interest rates trickling down to money market; considered both in context of speed and attainment. Third, a Vector Error Correction Model and Autoregressive Distributed Lag Model

(ARDL) was used to circumspect the 32-year long data to decipher the econometric deductions robustly. The scrutinisation of the existing literature on financial market and scheduled commercial banks in there embodiment with RBI policies brings in light the augmenting yet partial behavioral response.

The pass through from the policy decision to bank lending behavior of India's banking sector is a composite structure of long-run and short-run associations among variables. The research study is arranged as a two-step examination of transmission mechanism under the policy rate channel. This channel encapsulates the most traditional channel, i.e., the interest rate channel along with the credit lending channel. The two step modeling took cognizance of the very significant factor in the interim that convincingly vanquishes the monetary policy process outreaching a potential reformative Indian environment. It is the financial environment that reflects a telling story of the country's liquidity health and proves a crucial platform in either facilitating or interrupting the effective mechanism of monetary policy transmission. The translation of achievement of economic goal into advancement of financial market has been red-hot among economic researchers which spurred policy makers to enhance the level of integration of the financial markets in such a way that radical macroeconomic changes are reflected in all the markets. Since economic reforms, these markets are rather more volatile and responsive; hence making monetary policy more challenging.

The preference of weighted average call money rate (WACMR) proxying the money market intends a significant and advancing relation between its values and the values of the policy regulations. The relationship is not only a significant one but also relatively for a long period of time. The bound test of cointegration validates the declared above.

The schism of the thirty-two year on the footing of the regime shift the milieu prior to the New Monetary Policy Regime avouched a significant relation of WACMR with bank rates only. It also explicated that it took more than an eighteen quarters lags for the financial market to react to the policy signals. The economy then was experiencing of deepening of the money market and credit markets in a so called command economies characterized by fixed administered rates, capital control. The

economy typifies an incomplete term structure of money market; undergoing gradational yet significantly calibrated headways under the price discovery process starting 1990s corollary with reforms in the real sector.

While the Pass through from WACMR to Policy rate post to the New Monetary Policy Regime substantiated a significant relation of dependent variable with both the repo rate and reverse repo rate. Albeit, beholding the pre-crisis period of 2003-2007 of "Great Moderation"[54] globally with the immediate world liquidity crisis witnessing a considerable drop in growth followed by worldwide recession[55], the Monetary policy transmission climax out-reach with lags of less than three months. Such ciphering contributed to informational observation of a pronounced progression since the regime shift cinched in the time warp.

The headway since the shift triumphed more than fifteen manifolds. Such shifts-enabled in operating procedure based on direct quantity-based to indirect interest based instruments generated greater reliance on interest rates to flag the stance of monetary policy. Therefore, the intensity of policy rate transmits through the term structure of interest rate strengthened with time, attested by the varying transmission in due time course. The Reserve Bank has been capable of better transmitting the monetary policy signals under the new monetary regime through a single policy repo rate. The empirical evidence in the error correction models suggests a significant improvement in the monetary policy transmission under the new operating framework.

The second test of investigation of effectiveness of pass through found a short-run alliance account. This runs parallel with the turn in operational control of RBI over market management through short-term indirect instruments. While testing the presence and effectiveness of credit lending channel in terms of timing relationships relying on short term responses, deals with the drawbacks ignoring the nature of loans being sticky contracts. In cases of fall in reserves deposits in case of monetary

[54] High growth rate with price stability

[55] The formatting of financial products as combination of securities was more of an "originate-to-distribute"[55] model rather than "originate-to-hold" model[55] in presence of serious lapses in regulation, lack of systemic financial stability and assessment of risks (IMF, 2009).

tightening, they sell off securities. It is only after few quarter lags, banks decrease their loans and its rates and the real activity follows suit dramatically immediately[56].

We know now that credit channel work in tandem with money channel, it becomes obvious that contraction introduced by it will result into decline in output, which in turn causes the bank loans to further decline.

Another interpretation about changes in the quantum of bank lending within overall bank portfolio is also swayed by factors other than interventions through monetary policy instruments. It could be the phased opening of the economy to the worlds as well as the prudential norms as proxied by capital adequacy ratios, asset quality, income recognition and provisioning that exercise influence over the bank lending activities and its behavior.

The reforms in field of money and finance have made India a laboratory case for testing its transmission mechanism in post reform period. In an emerging economy like India, in the examination of credit channel, the study vindicates the existence of the first step of transmission mechanism in Indian Economy tallying the crucial inter-linkage among short term policy rates and medium-term lending and deposit rates. The results substantiate the effectiveness of monetary policy. It is clear that in India every time a change is introduced in a policy rate after a time lag it is followed by a conforming change in the lending rates.

There is still perpetual existence of financial and non-financial intermediary. The financial intermediaries like commercial banks, insurance companies, interbank markets, etc., largely trade amongst themselves. This ignites externality of mismatch between liability and assets which stems a self-amplifying crunch of liquidity glitches across the financial sector. Further an apprehensive decline in asset values and corresponding efforts to set balance sheet right exudes trouble, thus further reducing the market values. This is the reason why India's money market is active for clearing day to day surplus and deficits among banks as a regular source of funding. There is a need for intensive asset liability management (ALM) guidelines from the RBI.

[56] Leontief production function

SECTION 2

Hypothesis Tested

Hypothesis 1

H_0 : There a complete pass-through from policy changes to bank interest rates.

H_1: There exists an incomplete pass-through from policy changes to bank interest rates.

The results reject the Null Hypothesis as there is less than a 100 per cent pass-through display through the elasticity degree.

Hypothesis 2

H_0: There is no significant speed of adjustment after policy induced disequilibrium.

H_1: There is a significant speed of adjustment after policy induced disequilibrium.

The speed and degree of adjustment after a shock induced disequilibrium reaches back to its balanced position but after some time lags. Thus, we reject the null hypothesis.

Hypothesis 3

H_0: There is no difference between India's monetary policy framework in terms of credit channel transmission in a pre and post new monetary policy regime.

H_1: There exists a significant difference between India's monetary policy framework in terms of credit channel transmission in a pre and post new monetary policy regime.

The monetary policy framework post the adoption of New Monetary policy regime proved better with faster speed of adjustment pass through than the former in terms of number of monthly lags. Consequently, the null hypothesis is rejected.

SECTION 3

Suggestion and Policy Implications

The RBI needs fine-tuning of the policy tools. For this it is imperative to take care of price signals along with quantity signals. This builds a more integrated financial market within the home country and also internationally. Moreover, in an open economy, with a careful pursuance of short and medium term target of financial stability, price stability and exchange stability, using a short rate instrument such as repo rate can successfully send programmed signals to the money, credit and capital market. Eventually, such move in an incorporated environment would drive the money market to commence the corresponding spectrum of interests.

The economic reforms (1992) implemented in the Indian financial sector brought about instituting of new private sector and foreign banks with decontrolling of interest rates and forging prudential norms by RBI in the form of capital adequacy ratios (BASEL III) and financial stability[57]. This is clearly vocalizes the Indian policy ethos and belief that free markets cannot always vest best outcome, thus stressing a strong case of regulation of the sector.

The renowned micro-economic theory of firm does not hold solid for financial firms when its role is reflected in terms of economic growth in a developing country. Moreover, Walrasian equilibrium results in market failure. Such fiscal and monetary bailouts proved boon to the economy as RBI succeeded in maintaining financial stability even at the time of crisis. Yet it must be acknowledged that that GFC cannot be treated as an isolated event as Indian stock market and business is highly correlated with the US via outsourcing, technology transfer. The country needs to discover how to deal in order to de-escalate the risks of globalization.

A transmission can only be propitious if the banks proceed the benefit of the credit expansion by the RBI (in case of policy cut) to credit-constrained borrowers. The customers with high marginal propensity to borrow are likely to spend more. But it is the behavior of Indian Banks to lend to those who already have ample funds and this does not give the economy a cyclical boost. This pattern is the cause of the inverse

[57] Narasimham Committee (1991)

relation between marginal propensity to borrow and risk score of borrowers. This disconnect is one of the causes that substantiates the long lag of 10 months for the monetary policy outreach in this research and the failure of the monetary authorities attempt to expand credit and fight recession. In addition, MPTMs is not just about talking banks into lowering their benchmark in tandem with the monetary policy expectations but also to lend credit to the 'right' borrowers.

There is a need of exercising of greater bank's autonomy. This calls for separation of ownership and management, bureaucracy and business management which builds up an environment of accountability for performance and malfeasance as well.

SECTION 4

Limitations and Direction for Future

- This research thesis confines itself to the monetary sector of the Indian economy keeping constant the demand function of the real sector. Hence, this opens scope for further follow up research in the future in the area of monetary policy transmission mechanism study.
- The thirty-two years time period time-series analysis entails in it some phenomenally abrupt and drastic shifts tending to structural breaks vis-à-vis Indian Economic Reforms, Global Financial Crisis and Demonetisation. These displacements have been duly captured such that it does not show spurious regression results. This sets the research to extended search of an even better model that could sufficiently seize such outliers incontestably.

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APPENDIX

Monthly Financial Market and Policy Rates Post New Monetary Policy Regime

Year	BANKRATE	CALLRATE	SLR	CRR
1985M01	10	10	36	9
1985M02	10	10	36	9
1985M03	10	10	36	9
1985M04	10	9.99	36	9
1985M05	10	10	36	9
1985M06	10	10	36.5	9
1985M07	10	10	37	9
1985M08	10	10	37	9
1985M09	10	10	37	9
1985M10	10	10	37	9
1985M11	10	10	37	9
1985M12	10	10	37	9
1986M01	10	10	37	9
1986M02	10	10	37	9
1986M03	10	10	37	9
1986M04	10	10	37	9
1986M05	10	10	37	9
1986M06	10	10	37	9
1986M07	10	9.99	37	9
1986M08	10	9.949999999999999	37	9
1986M09	10	10	37	9
1986M10	10	10	37	9
1986M11	10	10	37	9
1986M12	10	10	37	9
1987M01	10	9.94	37	9
1987M02	10	10	37.5	9.5
1987M03	10	10	37.5	9.5
1987M04	10	9.699999999999999	37.5	9.5
1987M05	10	9.98	37.5	9.5
1987M06	10	9.99	37.5	9.5
1987M07	10	9.880000000000001	37.5	9.5
1987M08	10	9.98	37.5	9.5
1987M09	10	9.449999999999999	37.5	9.5
1987M10	10	9.98	38	10
1987M11	10	10	38	10
1987M12	10	9.09	38	10
1988M01	10	10	38	10
1988M02	10	10	38	10
1988M03	10	10	38	10
1988M04	10	10	38	10
1988M05	10	9.83	38	10
1988M06	10	9.32	38	10
1988M07	10	9.529999999999999	38	10.5
1988M08	10	9.61	38	10.5
1988M09	10	9.789999999999999	38	11
1988M10	10	9.69	38	11
1988M11	10	9.59	38	11
1988M12	10	9.49	38	11
1989M01	10	9.36	38	11
1989M02	10	9.880000000000001	38	11

1989M03	10	9.99	38	11
1989M04	10	10.92	38	11
1989M05	10	14.82	38	11
1989M06	10	12.68	38	11
1989M07	10	10.11	38	15
1989M08	10	10.15	38	15
1989M09	10	10.08	38	15
1989M10	10	12.66	38	15
1989M11	10	16.16	38	15
1989M12	10	10.52	38	15
1990M01	10	10.65	38	15
1990M02	10	11.43	38	15
1990M03	10	19.39	38	15
1990M04	10	15.95	38	15
1990M05	10	19.4	38	15
1990M06	10	13.53	38	15
1990M07	10	10.8	38	15
1990M08	10	12.46	38	15
1990M09	10	15.15	38.5	15
1990M10	10	25.16	38.5	15
1990M11	10	17.97	38.5	15
1990M12	10	13.64	38.5	15
1991M01	10	14.02	38.5	15
1991M02	10	13.78	38.5	15
1991M03	10	18.5	38.5	15
1991M04	10	21.18	38.5	15
1991M05	10	34.92	38.5	15
1991M06	10	24.77	38.5	15
1991M07	11	21.63	38.5	15
1991M08	11	13.7	38.5	15
1991M09	11	12.82	38.5	15
1991M10	11	21.82	38.5	15
1991M11	12	22.31	38.5	15
1991M12	12	12.66	38.5	15
1992M01	12	11.75	38.5	15
1992M02	12	9.41	38.5	15
1992M03	12	14.25	38.5	15
1992M04	12	26.57	38.5	15
1992M05	12	35.29	38.5	15
1992M06	12	15.82	38.5	15
1992M07	12	12.98	38.5	15
1992M08	12	10.76	38.5	15
1992M09	12	11.42	38.5	15
1992M10	12	11.79	38.5	15
1992M11	12	11.51	38.5	15
1992M12	12	11.23	38.5	15
1993M01	12	12.22	38.25	15
1993M02	12	12.39	38	15
1993M03	12	13.9	37.75	15
1993M04	12	13.43	37.75	14.5
1993M05	12	9.130000000000001	37.75	14
1993M06	12	8.01	37.75	14

1993M07	12	6.47	37.75	14
1993M08	12	5.71	37.75	14
1993M09	12	5	37.5	14
1993M10	12	5.66	37.25	14
1993M11	12	6.35	34.75	14
1993M12	12	6.5	34.75	14
1994M01	12	5.71	34.75	14
1994M02	12	5.2	34.75	14
1994M03	12	4.3	34.75	14
1994M04	12	4.900000000000001	34.75	14
1994M05	12	5.84	34.75	14
1994M06	12	6.7	34.75	14.5
1994M07	12	5.98	34.75	14.75
1994M08	12	5.75	34.25	15
1994M09	12	15.27	33.75	15
1994M10	12	7.89	31.5	15
1994M11	12	8.369999999999999	31.5	15
1994M12	12	9.710000000000001	31.5	15
1995M01	12	15.32	31.5	15
1995M02	12	13.27	31.5	15
1995M03	12	13.74	31.5	15
1995M04	12	10.91	31.5	15
1995M05	12	13.39	31.5	15
1995M06	12	14.43	31.5	15
1995M07	12	11.28	31.5	15
1995M08	12	10.11	31.5	15
1995M09	12	12.09	31.5	15
1995M10	12	20.7	31.5	15
1995M11	12	34.83	31.5	14.5
1995M12	12	16.77	31.5	14
1996M01	12	14.53	31.5	14
1996M02	12	17.05	31.5	14
1996M03	12	28.75	31.5	14
1996M04	12	11.38	31.5	13.5
1996M05	12	10.88	31.5	13
1996M06	12	10.87	31.5	13
1996M07	12	3.59	31.5	12
1996M08	12	6.07	31.5	12
1996M09	12	8.36	31.5	12
1996M10	12	9.58	31.5	11.5
1996M11	12	6.26	31.5	11.5
1996M12	12	8.07	31.5	11.5
1997M01	12	4.84	31.5	11
1997M02	12	5.08	31.5	10
1997M03	12	4.349999999999999	31.5	10
1997M04	11	1.22	31.5	10
1997M05	11	5.9	31.5	10
1997M06	10	5.16	31.5	10
1997M07	10	3.77	31.5	10
1997M08	10	5.86	31.5	10
1997M09	10	6.71	31.5	10
1997M10	9	6.25	25	9.75

1997M11	9	6.3	25	9.5
1997M12	9	8.210000000000001	25	10
1998M01	11	28.7	25	10.5
1998M02	11	9.699999999999999	25	10.5
1998M03	10.5	8.75	25	10.25
1998M04	10	6.73	25	10
1998M05	10	6.75	25	10
1998M06	9	6.42	25	10
1998M07	9	6.02	25	10
1998M08	9	7.59	25	10
1998M09	9	8.41	25	11
1998M10	9	8.42	25	11
1998M11	9	8	25	11
1998M12	9	8.33	25	11
1999M01	9	10.04	25	11
1999M02	9	8.86	25	10.5
1999M03	8	8.49	25	10.5
1999M04	8	7.63	25	10.5
1999M05	8	8.710000000000001	25	10
1999M06	8	8.09	25	10
1999M07	8	8.18	25	10
1999M08	8	9.4	25	10
1999M09	8	9.76	25	10
1999M10	8	10.9	25	10
1999M11	8	8.07	25	9.5
1999M12	8	7.72	25	9
2000M01	8	7.87	25	9
2000M02	8	10.31	25	9
2000M03	8	9.39	25	9
2000M04	7	6.75	25	9
2000M05	7	7.48	25	8.5
2000M06	8	11.08	25	8
2000M07	8	7.77	25	8
2000M08	8	13.06	25	8.25
2000M09	8	10.32	25	8.5
2000M10	8	9.07	25	8.25
2000M11	8	9.279999999999999	25	8.25
2000M12	8	8.76	25	8.25
2001M01	8	9.89	25	8.25
2001M02	7.5	8.51	25	8.25
2001M03	7	7.78	25	8

Source: RBI Weekly Statistical Supplements, Handbook of Statistics on Indian Economy

Monthly Financial Market and Policy Rates Post New Monetary Policy Regime

Year	CALLRATE	REPO	REVREPO
2001M04	2.01356879752912	9	6.75
2001M05	2.08318452795867	8.75	6.5
2001M06	1.97962120639762	8.75	6.5
2001M07	1.97269117173295	8.5	6.5
2001M08	1.93730177451871	8.5	6.5
2001M09	1.98787434815434	8.5	6.5
2001M10	2.00148000021012	8.5	6.5
2001M11	1.94161522477243	8.5	6.5
2001M12	1.95727390770562	8.5	6.5
2002M01	1.89160480419777	8.5	6.5
2002M02	1.90657514365663	8.5	6.5
2002M03	1.94161522477243	8.5	6
2002M04	1.88403474533722	8	6
2002M05	1.93152141160321	8	6
2002M06	1.79840401194672	8	5.75
2002M07	1.74919985480925	8	5.75
2002M08	1.7439688053917	8	5.75
2002M09	1.74919985480925	8	5.75
2002M10	1.74571553072664	8	5.5
2002M11	1.69561560867515	7.5	5.5
2002M12	1.71918877639322	7.5	5.5
2003M01	1.73342389221509	7.5	5.5
2003M02	1.74221902366791	7.5	5.5
2003M03	1.76814960358892	7.5	5
2003M04	1.58309393709449	7.1	5
2003M05	1.58309393709449	7	5
2003M06	1.59127394180642	6	5
2003M07	1.58923520511658	6	5
2003M08	1.57484646766448	7	4.5
2003M09	1.50407739677627	7	4.5
2003M10	1.53471436623816	7	4.5
2003M11	1.47704872438835	7	4.5
2003M12	1.48160454092421	7	4.5
2004M01	1.48839958405704	7	4.5
2004M02	1.46556754201439	7	4.5
2004M03	1.47476300910749	6	4.5
2004M04	1.45628673293992	6	4.5
2004M05	1.45861502269951	6	4.5
2004M06	1.47017584510059	6	4.5
2004M07	1.46093790411565	6	4.5
2004M08	1.48387468945875	6	4.5
2004M09	1.49290409617814	6	4.5
2004M10	1.53255686809814	6	4.75
2004M11	1.7263316639056	6	4.75
2004M12	1.66392609771817	6	4.75
2005M01	1.55180879959746	6	4.75
2005M02	1.56024766824332	6	4.75
2005M03	1.55180879959746	6	4.75

2005M04	1.56234630490025	6	5
2005M05	1.60743590976342	6	5
2005M06	1.62924053973028	6	5
2005M07	1.61342993370363	6	5
2005M08	1.61938824328726	6	5
2005M09	1.63315443905141	6	5
2005M10	1.63315443905141	6.25	5.25
2005M11	1.7561322915849	6.25	5.25
2005M12	1.79175946922805	6.25	5.25
2006M01	1.92132467358269	6.25	5.5
2006M02	1.9387416595767	6.5	5.5
2006M03	1.88403474533722	6.5	5.5
2006M04	1.7263316639056	6.5	5.5
2006M05	1.71199450075919	6.5	5.5
2006M06	1.74571553072664	6.75	5.75
2006M07	1.76814960358892	7	6
2006M08	1.80170980008122	7	6
2006M09	1.84530023615608	7	6
2006M10	1.90954250488443	7.25	6
2006M11	1.90061387414013	7.25	6
2006M12	2.155244505095331	7.25	6
2007M01	2.10169215061465	7.5	6
2007M02	1.96850998097255	7.5	6
2007M03	2.644044871126289	7.75	6
2007M04	2.11986345617875	7.75	6
2007M05	1.94017947434632	7.75	6
2007M06	0.883767540168595	7.75	6
2007M07	0.3147107448397	7.75	6
2007M08	1.84213567655312	7.75	6
2007M09	1.85785927093257	7.75	6
2007M10	1.79674701073909	7.75	6
2007M11	1.94304891677428	7.75	6
2007M12	2.01490302054226	7.75	6
2008M01	1.90061387414013	7.75	6
2008M02	1.95444505150515	7.75	6
2008M03	1.99741770620124	7.75	6
2008M04	1.82131827146959	7.75	6
2008M05	1.90210752639692	7.75	6
2008M06	2.05412373369554	8	6
2008M07	2.18041745901983	8.5	6
2008M08	2.19722457733622	9	6
2008M09	2.35801979988214	9	6
2008M10	2.37024374146786	8	6
2008M11	1.93441576962957	7.5	6
2008M12	1.78170913337455	6.5	5
2009M01	1.46787434811231	5.5	4
2009M02	1.41827740697294	5.5	4
2009M03	1.43270073393404	5	3.5
2009M04	1.24126858906963	4.75	3.25
2009M05	1.15688119679208	4.75	3.25
2009M06	1.17248213723456	4.75	3.25
2009M07	1.16627093714192	4.75	3.25

2009M08	1.16938135955631	4.75	3.25
2009M09	1.17865499634164	4.75	3.25
2009M10	1.17557332980423	4.75	3.25
2009M11	1.17248213723456	4.75	3.25
2009M12	1.19088756477728	4.75	3.25
2010M01	1.18172719537861	4.75	3.25
2010M02	1.16938135955631	4.75	3.25
2010M03	1.27815220250018	5	3.5
2010M04	1.26976054486393	5.25	3.75
2010M05	1.35583515363518	5.25	3.75
2010M06	1.65632149833295	5.25	3.75
2010M07	1.71018781553424	5.25	4
2010M08	1.65249740189454	5.5	4.5
2010M09	1.7263316639056	6	5
2010M10	1.87026253071599	6	5
2010M11	1.93296963777957	6.25	5.25
2010M12	1.90954250488443	6.25	5.25
2011M01	1.8779371654691	6.5	5.5
2011M02	1.90657514365663	6.5	5.5
2011M03	1.97823903617067	6.75	5.75
2011M04	1.88251383249651	6.75	5.75
2011M05	1.97823903617067	7.25	6.25
2011M06	2.01223279198638	7.5	6.5
2011M07	2.03077636969855	8	7
2011M08	2.07568449280212	8	7
2011M09	2.09309786812732	8.25	7.25
2011M10	2.11142458753288	8.5	7.5
2011M11	2.14943391349987	8.5	7.5
2011M12	2.20165917440408	8.5	7.5
2012M01	2.188295946591909	8.5	7.5
2012M02	2.17588743994808	8.5	7.5
2012M03	2.215937286268371	8.5	7
2012M04	2.1540850846756	8	7
2012M05	2.1126345090356	8	7
2012M06	2.09679018001444	8	7
2012M07	2.08567209143047	8	7
2012M08	2.07819075977818	8	7
2012M09	2.06939120582633	8	7
2012M10	2.07944154167983	8	7
2012M11	2.084429083190869	8	7
2012M12	2.08567209143047	8	7
2013M01	2.07944154167983	7.75	6.75
2013M02	2.05412373369554	7.75	6.75
2013M03	2.066862759472969	7.5	6.5
2013M04	2.0188950418118	7.5	6.5
2013M05	1.97962120639762	7.25	6.25
2013M06	1.97962120639762	7.25	6.25
2013M07	2.04898233419512	7.25	6.25
2013M08	2.29253475714054	7.25	6.25
2013M09	2.29958058397374	7.5	6.5
2013M10	2.20055236742889	7.75	6.75
2013M11	2.13416644136908	7.75	6.75

2013M12	2.09924416897601	7.75	6.75
2014M01	2.10291389786497	8	7
2014M02	2.10535292346433	8	7
2014M03	2.12465388450138	8	7
2014M04	2.12345842709661	8	7
2014M05	2.07944154167983	8	7
2014M06	2.089391872533	8	7
2014M07	2.1126345090356	8	7
2014M08	2.07693841146171	8	7
2014M09	2.05412373369554	8	7
2014M10	2.07191327525904	8	7
2014M11	2.05796251000271	8	7
2014M12	2.09309786812732	8	7
2015M01	2.06051353179431	8	7
2015M02	2.03861954715958	7.75	6.75
2015M03	2.01223279198638	7.5	6.5
2015M04	2.00012773496011	7.5	6.5
2015M05	2.02287119019144	7.5	6.5
2015M06	1.94876321803772	7.25	6.25
2015M07	1.95018670582257	7.25	6.25
2015M08	1.96150224381514	7.25	6.25
2015M09	1.98513086220859	7.25	6.25
2015M10	1.9139771019523	6.75	5.75
2015M11	1.91102289005487	6.75	5.75
2015M12	1.90805992492421	6.75	5.75
2016M01	1.91839212016142	6.75	5.75
2016M02	1.9154509415706	6.75	5.75
2016M03	1.92861865194525	6.75	5.75
2016M04	1.87026253071599	6.5	6
2016M05	1.86252854011626	6.5	6
2016M06	1.85159946958407	6.5	6
2016M07	1.85316809735669	6.5	6
2016M08	1.85473426838944	6.5	6
2016M09	1.86097453824952	6.5	6
2016M10	1.82937633279936	6.25	5.75
2016M11	1.79175946922805	6.25	5.75
2016M12	1.80828877117926	6.25	5.75

Source: RBI Weekly Statistical Supplements, Handbook of Statistics on Indian Economy, CCIL

Scheduled Commercial Monthly Banks Lending Rates and Financial market rates

Year	BASE_RATE	DEPOSIT_RATE	WACMR
1999M01	10.25	10.04	
1999M02	13.5	10.25	8.86
1999M03	12.5	10.25	8.49
1999M04	12.25	9.25	7.63
1999M05	12.25	9.25	8.710000000000
1999M06	12.25	9.25	8.09
1999M07	12.25	9.5	8.18
1999M08	12.25	9.25	9.4
1999M09	12.25	9.25	9.76
1999M10	12.25	9.25	10.9
1999M11	12.25	9.25	8.07
1999M12	12.25	9.25	7.72
2000M01	12.25	9.25	7.87
2000M02	12.25	9.25	10.31
2000M03	12.25	9.5	9.39
2000M04	11.5	9	6.75
2000M05	11.5	8.75	7.48
2000M06	11.5	8.75	11.08
2000M07	11.5	8.75	7.77
2000M08	12.125	9.25	13.06
2000M09	12.25	9.25	10.32
2000M10	12.25	9.25	9.07
2000M11	12.25	9.25	9.2799999999999
2000M12	12.25	9.25	8.76
2001M01	12.25	9.25	9.89
2001M02	12.25	9.25	8.51
2001M03	11.5	9.25	7.78
2001M04	11.5	9.25	7.49
2001M05	11.5	8.75	8.0299999999999
2001M06	11.5	8.75	7.24
2001M07	11.5	8.75	7.19
2001M08	11.5	8.75	6.94
2001M09	11.5	8.75	7.3
2001M10	11.5	8.5	7.4
2001M11	11.5	8.5	6.97
2001M12	11.5	8	7.08
2002M01	11.5	8	6.63
2002M02	11.5	8	6.73
2002M03	11.5	8	6.97
2002M04	11.5	7.75	6.58
2002M05	11.5	7.625	6.9
2002M06	11.5	7.625	6.04
2002M07	11.5	7.625	5.75
2002M08	11.5	7.5	5.72
2002M09	11.5	7	5.75
2002M10	11.5	7	5.73
2002M11	11.125	6.375	5.45
2002M12	11.125	6.375	5.58

2003M01	11.125	5.875	5.66
2003M02	11.125	5.875	5.71
2003M03	11.125	5.75	5.86
2003M04	11.125	5.75	4.87
2003M05	11	5.625	4.87
2003M06	11	5.5	4.91
2003M07	11	5.5	4.9000000000000
2003M08	11	5.5	4.83
2003M09	11	5.375	4.5
2003M10	11	5.5	4.6399999999999
2003M11	11	5.5	4.38
2003M12	10.75	5.375	4.4000000000000
2004M01	10.625	5.875	4.43
2004M02	10.625	5.875	4.33
2004M03	10.625	5.875	4.37
2004M04	10.625	5.875	4.29
2004M05	10.625	5.875	4.3
2004M06	10.625	5.875	4.3499999999999
2004M07	10.625	5.875	4.3099999999999
2004M08	10.625	5.875	4.41
2004M09	10.5	5.875	4.45
2004M10	10.5	5.875	4.63
2004M11	10.5	5.875	5.62
2004M12	10.5	5.75	5.28
2005M01	10.5	5.75	4.72
2005M02	10.5	5.75	4.76
2005M03	10.5	5.75	4.72
2005M04	10.5	5.75	4.7699999999999
2005M05	10.5	5.75	4.99
2005M06	10.5	5.75	5.0999999999999
2005M07	10.5	5.75	5.0199999999999
2005M08	10.5	5.75	5.05
2005M09	10.5	5.75	5.12
2005M10	10.5	5.75	5.12
2005M11	10.5	5.75	5.79
2005M12	10.5	6	6
2006M01	10.5	6	6.83
2006M02	10.5	6.25	6.95
2006M03	10.5	6.5	6.58
2006M04	10.5	6.5	5.62
2006M05	11	6.625	5.54
2006M06	11	6.625	5.73
2006M07	11	6.625	5.86
2006M08	11.25	7.25	6.06
2006M09	11.25	7.375	6.33
2006M10	11.25	7.375	6.75
2006M11	11.25	7.375	6.69
2006M12	11.25	7.5	8.6300000000000
2007M01	11.75	8	8.18
2007M02	12.375	8.25	7.16
2007M03	12.375	8.25	14.07
2007M04	13	8.25	8.33

2007M05	13	8.25	6.96
2007M06	13	8.550000000000001	2.42
2007M07	13	8.550000000000001	0.73
2007M08	13	8.75	6.31
2007M09	13	8.75	6.41
2007M10	13	8.75	6.03
2007M11	13	8.5	6.98
2007M12	13	8.625	7.5
2008M01	13	8.625	6.69
2008M02	12.625	8.625	7.06
2008M03	12.5	8.625	7.37
2008M04	12.5	8.625	6.18
2008M05	12.5	8.5	6.7
2008M06	12.625	8.625	7.8
2008M07	13	9.125	8.85
2008M08	13.875	9.375	9
2008M09	13.875	9.375	10.57
2008M10	13.875	9.625	10.7
2008M11	13.875	9.5	6.92
2008M12	13.875	9.5	5.94
2009M01	12.25	8.5	4.34
2009M02	12	8.375	4.13
2009M03	12	8.125	4.1900000000000
2009M04	12	7.75	3.46
2009M05	11.625	7.375	3.18
2009M06	11.625	7.25	3.23
2009M07	11.5	7.25	3.21
2009M08	11.5	7.125	3.22
2009M09	11.5	7.125	3.25
2009M10	11.5	6.875	3.24
2009M11	11.5	6.75	3.23
2009M12	11.5	6.75	3.29
2010M01	11.5	6.75	3.26
2010M02	11.5	6.75	3.22
2010M03	11.5	6.75	3.59
2010M04	11.5	6.75	3.56
2010M05	11.5	6.75	3.88
2010M06	11.5	6.75	5.24
2010M07	7.75	6.75	5.53
2010M08	7.75	7.25	5.22
2010M09	8	7.5	5.62
2010M10	8	7.5	6.49
2010M11	8	7.5	6.91
2010M12	8.300000000000001	7.425	6.75
2011M01	8.5	7.425	6.54
2011M02	8.875	8.875	6.73
2011M03	8.875	8.625	7.23
2011M04	9	8.625	6.57
2011M05	9.625	6.925	7.23
2011M06	9.625	8.675000000000001	7.48
2011M07	10.125	8.875	7.62
2011M08	10.375	9	7.97

2011M09	10.375	8.875	8.11
2011M10	10.375	8.875	8.26
2011M11	10.375	8.875	8.58
2011M12	10.375	8.875	9.0399999999999
2012M01	10.375	8.75	8.92
2012M02	10.375	8.875	8.81
2012M03	10.375	8.875	9.17
2012M04	10.375	8.875	8.6199999999999
2012M05	10.125	8.625	8.27
2012M06	10.25	8.625	8.14
2012M07	10.125	8.625	8.0500000000000
2012M08	10.25	8.875	7.99
2012M09	10.125	8.875	7.92
2012M10	10.125	8.75	8
2012M11	10.125	8.75	8.0399999999999
2012M12	10.125	8.75	8.0500000000000
2013M01	10.125	8.75	8
2013M02	10.1	8.25	7.8
2013M03	9.975	8.25	7.9
2013M04	9.975	8.25	7.53
2013M05	9.975	8.25	7.24
2013M06	9.975	8.25	7.24
2013M07	9.975	8.25	7.76
2013M08	9.975	8.5	9.9
2013M09	10.025	8.5	9.9700000000000
2013M10	10.025	8.525	9.0299999999999
2013M11	10.125	8.525	8.4499999999999
2013M12	10.125	8.525	8.16
2014M01	10.175	8.550000000000001	8.19
2014M02	10.125	8.550000000000001	8.2100000000000
2014M03	10.125	8.625	8.3699999999999
2014M04	10.125	8.625	8.36
2014M05	10.125	8.525	8
2014M06	10.125	8.525	8.08
2014M07	10.125	8.525	8.27
2014M08	10.125	8.525	7.98
2014M09	10.125	8.525	7.8
2014M10	10.125	8.525	7.94
2014M11	10.125	8.5	7.83
2014M12	10.125	8.5	8.11
2015M01	10.125	8.375	7.85
2015M02	10.125	8.375	7.68
2015M03	10.125	8.375	7.48
2015M04	10	8.25	7.39
2015M05	9.875	8.25	7.56
2015M06	9.85	8.25	7.02
2015M07	9.85	8.125	7.03
2015M08	9.85	7.75	7.11
2015M09	9.85	7.625	7.28
2015M10	9.5	7.45	6.78
2015M11	9.5	7.45	6.76
2015M12	9.5	7.45	6.74

2016M01	9.5	7.45	6.81
2016M02	9.5	7.45	6.79
2016M03	9.5	7.45	6.88
2016M04	9.5	8.949999999999999	6.49
2016M05	9.5	9.025	6.44
2016M06	9.5	9.025	6.37
2016M07	9.5	9.025	6.38
2016M08	9.5	9	6.39
2016M09	9.5	9	6.43
2016M10	9.475	8.949999999999999	6.23
2016M11	9.475	8.824999999999999	6
2016M12	9.475	8.824999999999999	6.1
2017M01	9.449999999999999	7.975	5.98
2017M02	9.449999999999999	7.975	5.95
2017M03	9.425000000000001	7.975	5.97

Source: RBI's Basic Statistical Returns of Scheduled Commercial Banks in India, CCIL