

Does Interest Rate Matter for Non-food Credit of Commercial Banks in India?

*A Dissertation Submitted to the University of Hyderabad in Partial Fulfillment of the
Requirements for the Award of*

MASTER OF PHILOSOPHY

IN

ECONOMICS

BY

TIKELAL MEHER



SCHOOL OF ECONOMICS

UNIVERSITY OF HYDERABAD

HYDERABAD-500046

DECEMBER-2015



DECLARATION

I hereby declare that the work embodied in the present dissertation entitled "*Does Interest Rate Matter for Non-food Credit of Commercial Banks in India?*" carried out under the supervision of **Dr. Alok Kumar Mishra**, School of Economics, for the award of Master of Philosophy in Economics from University of Hyderabad, is an original work of mine.

To the best of my knowledge, no part of this dissertation has been submitted for the award of any research degree or diploma at any University or institution. This is also free from plagiarism.

I hereby agree my thesis can be deposited in Shodhganga/INFLIBNET. A report of plagiarism statistics from the university librarian has been enclosed.

(Signature of the Supervisor)

Assistant Prof. Alok Kumer Mishra

Place: Hyderabad

Date: 31/12/2015

(TIKELAL MEHER)

Reg. No. 14SEHL17

CERTIFICATE

This is to certify that the research embodied in the present dissertation entitled “Does Interest Rate Matter for Non-food Credit of Commercial Banks in India?” has been carried out by Tikelal Meher under my supervision for the full period prescribed under M. PHIL ordinances of the university.

I declare to the best of my knowledge that no part of the thesis was earlier submitted for the award of a research degree of any university or institute.

(Signature of the Supervisor)

Assistant Prof. Alok Kumar Mishra

(Signature of the Candidate)

Name: Tikelal Meher

Reg. No. 14SEHL17

(Signature of the Dean, School of Economics)

ACKNOWLEDGEMENTS

I would like to express my deep gratitude to my thesis advisor Dr. Alok Kumar Mishra for his guidance, encouragement and co-operation throughout my research work. His valuable comments at every stages of my work shaped my understanding and helped me in refining the contents of the thesis.

I am thankful to Prof. B. Kamaiah, Dean School of Economics, others teaching and non-teaching staff for providing constant encouragement to complete this work.

I offered my special thanks to my beloved parents, brothers and sisters who have been sources for constant encouragement to my academic life.

I would like to convey my heartly thanks to my seniors and friends, especially Chitra, Abhash, Anand, Roshan, Chintamani, Rukmani, Niranjan, Rohit, Lilu, Chodaganga, Rajesh, Bruhit, Dasarathi, Kali Kumar, Debasish, Sagar, Simpul, Hrushikesh, Ricoo, Sujit, Alok, Arun, Ketki, Parijata, Sushma, Sita, Abhishek, Bikash and Ashish for their help during my research work.

I am also thankful to the staff of libraries at University of Hyderabad their help in my research work. I would thanks to all those who supported in one way or the other for the completion of the thesis.

Tikelal Meher

DEDICATED TO
MY
BELOVED PARENTS

CONTENTS

CHAPTERS	PAGES
LIST OF TABLES.....	..ii
LIST OF FIGURES.....	..iii
ABBREVIATION.....	..iv
CHAPTER I	
INTRODUCTION, BACKGROUND AND OBJECTIVES OF THE STUDY.....	1-5
1.1 Introduction and Motivation of the Study.....	1
1.2 Objectives of the Study.....	4
1.3 Methodology and Data.....	4
1.4 Organization of the study.....	5
CHAPTER-II	
THEORITICAL UNDERPINNINGS AND LITERATURE REVIEW.....	6-16
2.1 Introduction.....	6
2.2 Theoretical Underpinnings.....	6
2.3 Recent Approach to the Theory.....	8
2.4 Literature Review.....	10
2.5 Conclusion.....	15
CHAPTER – III	
CREDIT GROWTH, SECTORAL CREDIT GROWTH AND POLICY RATE CHANGES: A TREND ANALYSIS.....	17-33
3.0 Introduction.....	17
3.1 Trends in Non Food Credit of Commercial Banks.....	20
3.2 Interest Rate Issues and Policy Changes.....	22
3.3 Sectoral Distribution of Non-Food Credit of Commercial Banks.....	25
3.3. A. Agriculture.....	29
3.3. B. Industry.....	30
3.3. C. Service Sector.....	31
3.3. D. Personal Loans.....	31
3.4 Conclusion.....	32

CHAPTER-IV

METHODOLOGY AND EMPERICAL FINDINGS.....34-55

4.0. Introduction.....	34
4.1. Methodology of the Study.....	34
4.1.1. Methodology of Time Series.....	34
4.1.1.1. Unit Root Test.....	35
4.1.1.1.1. The Augmented Dickey Fuller Test.....	36
4.1.1.1.2. Phillips-Perron (PP) Test.....	37
4.1.1.2. Cointegration and Error Correction.....	37
4.1.1.2.1. Johansen's and Co-integration Test.....	38
4.1.1.2.2. Error Correction Model.....	40
4.1.2. Methodology of Panel Data.....	41
4.1.2.1. The Fixed Effects Model.....	41
4.1.2.2. Random Effects Model.....	41
4.1.2.3. Model Specification Test.....	42
4.2. Variable and Data Description.....	42
4.3. Data Analysis and Results.....	43
4.3.1. Descriptive Statistics.....	43
4.3.2. Correlation Matrix.....	44
4.3.3. Stationary Test.....	44
4.3.4. Regression Result.....	47
4.3.5. Causality Test.....	48
4.3.5.1. Granger Causality Test.....	49
4.3.6. Co-integration Result.....	50
4.3.7. Short-run and Long-run Causality Test.....	51
4.3.8. Panel Data Analysis of Sectoral Non-food Credit and Interest Rates.....	53
4.3.9. Results of Panel Data Analysis.....	53
4.4. Conclusion.....	55

CHAPTER-V

SUMMARY OF MAJOR FINDINGS AND SCOPE FOR FURTHER RESEARCH.....56-59

5.1 Limitations of the Study.....59

5.2 Scope for Further Research.....59

BIBLIOGRAPHY.....64

LIST OF TABLES

Table No. Name	Page No.
Table 4.1. Descriptive Statistics.....	43
Table. 4.2 Correlation Coefficient Matrix Among the Variables.....	44
Table. 4.3. Augmented Dickey- Fuller Unit Root Test.....	46
Table. 4.4. Phillips-Perron test of Stationarity.....	47
Table. 4.5. Lag Length Criterion for Granger’s Causality Test.....	49
Table. 4.6. VAR Block Exogeneity Test (causality Analysis).....	50
Table. 4.7. Cointegrating Test.....	51
Table. 4.8. Error correction model for monthly bank credit demand.....	52
Table. 4.9. Results of Panel Unit Root.....	53
Table. 4.10. Results of panel Data Relating to sectorial distribution of non-food credit.....	53
Table. 4.11. Results of Fixed Effect Model.....	54
Table. 4.12. Results of Hausman Test.....	54
Table. 4.13. Cross-section Random Effects test comparisons.....	54

LIST OF FIGURES

Figure No.	Name	Page No.
Figure. III.1:	Percentage growth rate of non-food credit	20
Figure. III.2	Trends of different rates.....	24
Figure III.3	Trends in Major monetary Policy Rates.....	25
Figure III. 4	Percentage share of Sectoral Distribution of non -food credit.....	26
Figure III.5	Increasing Trends of Sectoral Non-food Bank credit.....	27
Figure III.6	Percentage increase in share of Sectoral credit (2006-14).....	28
Figure IV.1:	Time Series Plot of the Data at Level.....	45
Figure IV.2:	Augmented Dickey Fuller Test graph.....	46

ABBREVIATION

ADF	Augmented Dickey Fuller
ADR	American Depository Receipts
AIC	Akaike Information Criteria
BPLR	Benchmark Primary Lending Rate
CRR	Cash Reserve Ratio
ECM	Error Correction Model
EFP	External Final Premium
EME	Emerging Market Economies
EPW	Economics And Political Weekly
FPE	Final Prediction Error
GDP	Gross Domestic Product
GDR	Global Depository Receipt
GNP	Gross National Product
HQ	Hannan Quin Information Criteria
IIP	Index For Industrial Production
IT	Information Technology
LAF	Liquidity Adjustment Facility
M_1	Narrow Money
M_2	M_1 + Post office saving
ML	Maximum Likelihood
MSS	Market Stabilisation scheme
NABARD	National Bank for Agriculture And Rural Development
NFC	Non Food Credit
OMO	Open Market Operation
PLR	Primary Lending Rate
PP	Phillips Perron
RBI	Reserve Bank Of India
RIDF	Rural Infrastructure Development Fund
RRB	Regional Rural Bank
SC	Schedule Caste

SC	Schwarz Information Criteria
SLR	Statutory Liquidity Ratio
ST	Schedule Tribe
T-BILL	Treasury Bill
US	United State
VAR	Vector Auto Regressive
VECM	Vector Error Correction Model
WACR	Weighted Average Of Call Money Rate

CHAPTER- I

INTRODUCTION, BACKGROUND AND OBJECTIVES OF THE STUDY

1.1 Introduction and Motivation of the Study:

Credit market plays an important role in sustaining growth and stability. Accesses to credit facilities are the issues in which people face in developing countries. This is the main reason behind which the policy makers in the developing countries, emphasizing on the Financial Inclusion, social Inclusion and Inclusive growth. Banks in India have an important role in the mobilization of funds from the savers to investors. Banks are the major player in the credit market in the process of the credit channel mechanism of the monetary policy in India. Before 1990s credit market was functioning in a restricted and strictly regulated manner with the administered interest rate policy by the central bank. However, post to the liberalization period, certain restrictions removed and mainly the interest rate is determined through market forces with flexible monetary policy interventions such as open market operations, call money rate and interest rate term structures.

The bank credit is the potential source of credit for the investors and there is high dependence on bank credit due to the lack of availability of other suitable alternative credit facilities and less developed capital market in developing countries. Industries and services sectors in the recent period are growing more rapidly need the financial assistance for their further improvement in their respective field in order to contribute to the economic growth. In addition to large industries, there are vast small and medium enterprises need financial help for their operation. That is why in India, the policy makers give importance to the functioning of the small and medium scale enterprises. Even though there are three major sources of raising capital such as borrowing from domestic commercial banks, borrowing from foreign banks, raising the capital from the public by issuing the shares in the primary markets and external commercial borrowings through American Depository Receipts (ADRs) and Global Depository Receipts (GDRs), domestic bank finances through commercial banks still play a predominant role for credit finance. Therefore, credits provided by the commercial banks in developing countries are much more important in recent time period.

Commercial banks are nothing but a profit seeking financial institutions, which deal with the money and credit. These two important functions of a commercial bank in dealing with money and credit help the fund mobilization process in the economy. The basic functions of these banks are accepting the deposits from the public and transferring it to the investors in terms of loans. In this process between the savers and investors, the banks play the intermediate role. This process of mobilization of saving into investments is exposed to one important issue in both supply and demand side, and that is the interest rate. This is due to the fact that the interest rate changes can affect the credit creation capacity and lending capacity of the commercial banks. The banks face the ultimate challenges in terms of managing its asset liability management when there are policy rate changes announced by the central banks.

Credit market functions in the economy relate to the transmission mechanism of the monetary policy framework. The transmission mechanism operates through the balance sheet channel of the banks. The traditional interest rate channel does not affect the economy in a systematic manner due to market imperfections like information asymmetry exist in financial markets. The importance of the credit channel has been given more emphasis on the monetary transmission due to its role in the stabilizing the economy in terms of the price and financial stability and maintain the balance between the savings and investments. Two sub channels, relating to this credit channel are the bank lending channel and the balance sheet channel where banks are the important source of financing credit to the small and medium firms in the developing countries. Changes in the monetary policy through the policy rates alteration, change the banks' capacity to create credit and the interest rate charged by the banks change accordingly. Contractionary monetary policy leads to the increase in interest rates and as a result of which credit by banks are costlier which affects the small and medium firms to finance their operation. On the other hand, large industries have the option to access the capital market and external sources of credit for their investments. Developing country like India, where a large number of firms depend on the commercial bank credit suffer more at the time of contraction in the monetary policy decisions.

Proper allocation of capital through managing the risk in an economy is the indication of efficient management of economic growth. Schumpeter (1911) given importance for the first time to the financial sector and emphasized that the development of the financial sector positively influence the economic growth and national income with relating to the different sector of the economy. Relating to this King and Levin (1993) argued that there is a strong positive relationship among the financial

sector development with economic growth, employment, capital accumulation process, income and productivity. Here, the issues regarding the financial sector development in developing countries come. Financial sector development requires the better and easy availability of credit with improvement in the stock market accessibility that depends on the size of the capital market and the level of credit. In this process, the role of financial institution cannot be ignored. Financial institution lending becomes more when they expect that the different sectors in the economy perform in an efficient and productive manner with the sign of improvement in the near future will lead to the improvement in the financial sector development as well as economic growth. The credit facility is provided by commercial banks in India are important in this respect due to their prominent role in the fund mobilization process from savers to investors in the distribution of loans among the different sectors of the economy according to their needs. Nevertheless decrease in the bank rate by the central bank of India reduced the weighted average of the lending rate offered by the commercial banks in India and promoted the lending capacity of the banks and created more confidence among the financial institutions for credit delivery.

During the crisis period the financial instability occurred and the banking sector and other financial sector credit flow started to decline. The Central bank also faces the problem to manage the price stability conditions. Most of the financial institution invested more on the government securities and did not want to take the risk of providing more credit to the different sectors of the economy. The monetary authority deregulated the interest rate mechanism, made changes in the reserve ratios with the introduced the LAF (Liquidity Adjustment Facility) and MSS (Market Stabilization Scheme). Despite of all these banks capitals, concentrations are more on the Government securities than the credit to the priority sectors. Commercial bank credit consists of both food and non-food credit, where non-food credit is the major share of the credit of banks in India. All the productive sectors such as industry, service, retail and agricultural sector come under the non-food credit constitute more than 95 percent of the total credit are the important segment of the credit markets in India. However, due to the high interest rates, the credit off take of the commercial banks has deteriorated drastically. The growth in non food bank credit off take has fallen 8.4 percent in June 2015 as compared with the increase of 13.0 percent in June 2014. This is perhaps the worst growth in the loan demand in India since last two decades. The slow growth in credit off take has been contributed by industry, agricultural and service sector jointly as explained by the Reserve Bank of India. The other reasons may be due to muted investments, raising risk

aversion owing to deteriorating asset quality of public sector banks and an increase in cheaper funds raised by commercial papers. Therefore, the relationship between the interest rates and the credit demand is the matter of debate in India. Some empirical evidence suggests that the interest rate is sensitive to credit demand, while there are some arguments against this. At the same time, there is a very little attention have been given to this issue in the earlier research papers. Therefore the entire thesis is an endeavor in this direction.

1.2 Objectives of the Study

In the light of the above background, the objectives of the study are,

- To empirically assess the impact of interest rates on non-food credit of commercial banks.
- To examine the responsiveness of interest rates on the different sectoral concentration of non food credit demand in India.

1.3 Methodology And Data:

In order to examine the possible relationship between the non food credit demand and interest rates, we have employed simple correlation analysis, regression analysis, Toda and Yamamoto Granger's causality analysis for exploring the short run dynamic relationship and Johansen's Maximum Likelihood procedure and Vector Error Correction model for examining the long run equilibrium relationship. As the study is based on the monthly time series data, we have employed Augmented Dickey Fuller test and Phillips Peron test to examine the unit root properties of the variables. To examine the responsiveness of interest rates on sectoral concentrations of non food credit demand, we have employed fixed and random effects model of the panel data analysis. To examine the robustness of the result we have employed the Hausman test of heterogeneity, short term causality tests etc.

The study is completely based on the monthly time series as well as panel data. The economic output is represented by the Index of Industrial Production as the monthly data on the Gross Domestic Product data are not readily available in the context of India. The interest rates are represented by the Repurchasing Agreement (Repo Rate), commercial papers, Weighted Average Call Money Rates, and the yield on the 364-Day Treasury Bill. The non food credit demand and its corresponding concentrations in terms of the different sectors such as agriculture, industry and

Service sectors are considered. The study is based on the monthly data and the study period is spanning from April 2001 to December 2014. The monthly data on all the above mentioned variables are sourced from the Handbook of Statistics, Indian Economy, different volumes, Report on Currency and Finance, different volumes, and Indian Economy Database, Reserve Bank of India.

1.4 Organization of the study:

This study has been organized in the following manner. The present chapter introduces the study; specify the motivations of the study, a statement of the problems, methodology and data description. The second chapter describes the theoretical issues pertaining the relationship between Non-food credit and interest rates along with survey of theoretical and empirical literature on this. The third chapter focuses on the trend analysis of the credit growth and interest rate changes in the post liberalization period in India. In the Fourth chapter, we have empirically examined the relationship between the non food credit demand of commercial banks and its sectoral concentrations in terms of the agricultural, industrial and service sectors with the different interest rates, such as Repo rates, 364-TBill yield, Call Money Rate, Commercial Papers and the economic output represented by the Index of Industrial Production. This chapter has been divided in two parts according to the different types of empirical data and methodologies have been included. The first part of the result is the time series data estimation and their analysis, while the panel data analysis has followed in the latter part of the chapter. The final chapter summarizes the issues, findings and conclusion of the study.

CHAPTER-II

THEORITICAL UNDERPINNINGS AND LITERATURE REVIEW

2.1 Introduction:

In this chapter, we have presented the theoretical underpinnings of the relationship between the interest rate changes and non food credit demand and its corresponding sectoral concentrations. The second part of this chapter reviews the previous theoretical and empirical literature on the relationship between interest rates and non food credit demand.

2.2 Theoretical Underpinnings

The historical perspective of the role of the banking system in financing the capital flows to the productive and the priority sectors of the economy is well recognized. Schumpeter (1911) in his innovation theory talks about the essentiality of bank credit to introduce something entirely new for breaking the stationary equilibrium in which the society exists, which hints about the role played by credit in creating fluctuations. In a Schumpeterian world, bank credit increases money income, which in turn increases the demand for the products of the old industries in relation to supply. As profits increase, old industries expand by borrowing from banks. This induces a secondary wave of credit inflation (Banarjee, K, 2012, Working Paper Series No. 22, RBI). The concept of bank credit always involves with the interest rate issues without which the lending and borrowing process cannot be operated in a stable manner. In the post depression American economy, Irving Fisher (1933) made an argument that the severity of the Great Depression occurred primarily due to the poor performance of the financial markets of the American economy. He explained the concept of ‘debt-inflation’: when the borrowers are highly expecting the profits greater than the interest payable or leveraged a small shock in the economy affects their productivity and lead to a series of bankruptcies, which create a decreasing trend of investment and demand for the intermediate goods which in turn leads to the change in the prices. This creates the real indebtedness of the productive sector more badly. By supporting this idea Gurley-Shaw (1955), the economic literature gave importance to the financial intermediaries who play an important role in the mobilization of loanable funds between the savers and borrowers.

The importance of money supply was a principal focus as an important financial aggregate in the publication by Friedman and Schwartz (1963) in their monetary history of the United States. They argued that there was the positive relationship between money supply and output at the time of great depression. Then, there is the role of the interest rate mechanism in the process of

money supply changes. During this period Modigliani and Miller (1958) viewed that finance has no role and the unanticipated monetary policy has only a transitory effect on real variables. Later, in 1980s once again the financial aspect of macroeconomics was given importance. Mishkin (1978) and Bernanke (1983) supports to the financial aspect of macroeconomics ideas in the context of the Great Depression in their studies. Their main argument was that the monetary aspect explanations by Milton Friedman and Schwartz was not sufficient for the explanation of the Great depression. They support the idea of finance did matter against Modigliani and favored the new ideas of “Credit View” which describes the importance of finance and banking sector of an economy in the generation of real variables.¹

The monetary policy operates through various channels. The credit channel is an important channel of monetary transmission mechanism to accelerate growth. According to the conventional “money view”, monetary policy influences the economy through interest rate. But, Bernanke and Blinder (1988) argued that the bonds and loans are not the perfect substitute and the monetary policy also operates through the credit channel (credit view). Credit view explains that any change in monetary policy raises or lowers the open market interest rate changes and the External Finance Premium (EFP) (it is the difference between the cost of fund raised externally and the fund raised internally) in the same direction. Due to this effect of policy on external finance premium, the impact of monetary policy fall in the cost of borrowing and real spending lead to the changes in real economic activities. In other words, according to the credit view, a change in the monetary policy that raises and lowers the open market interest rates tend to change the external finance premium in the same direction. Thus, monetary tightening increases EFP, while easing of monetary policy reduces EFP. As a result, the impact of a given change in short-term policy interest rates on demand and output is magnified, which reinforces the effects of variation in interest rates (Bernanke and Getler, 1988). It is a modification of IS-LM framework and contains all the elements that allow for the theoretical definition of imperfect substitution between credits on the one hand and bonds on the other.

¹ References- Microeconomics of Banking, the MIT Press, 2nd edition, 2008

2.3 Recent Approach to the Theory:

The impact of monetary policy on bank credit operates through the different channels. According to the conventional credit channel of monetary transmission mechanism there are two sub-channels through which credit conditions are expected to affect monetary transmission (Miskin 1996).

- i. **Bank lending channel** operates through modulation of bank reserves affected by monetary policy. Expansionary monetary policy leads to increase in bank deposit leads to increase in bank loans which in turn increase the investment and output. The important implication is that monetary policy will have a greater effect on expenditure by small firms that are more dependent on bank loans.
- ii. In **Balance-sheet channel** expansionary monetary policy decreases the interest rate leads to increase cash flow reduces adverse selection which in turn increases investment and output.

The main importance of credit view is that it concentrates on the asset side of banks in the process of monetary policy transmission.

The above two sub channels of the monetary transmission mechanism explain the impact of monetary policy channels on real economy. The argument made by Ciccarrelli, et al (2010) that the bank lending channel is conspicuous and stronger than the balance sheet channels, relating to the case of the firm, while for the household, it becomes opposite. In the case of banks which are smaller and less capitalized, the bank lending channel has been found by having the larger impact. According to the explanation given by Dr. Urjit Ptel committee² (2014) based on recent empirical evidence that substitution of trade credit became the alternative at the times of monetary contraction and led to the effectiveness of the credit channel. This was mainly the case of Emerging Market Economies (EMEs), where as in case of sub Saharan Africa, except South Africa, the credit channel found to have less responsive and weak due to the existence and domination of informal finance and lack of completion in the banking sectors with low penetration of institutional finances. In the case of many EMEs where there is the finance is much more dependent on banks, the credit channel is strong. The argument suggests that the dominance of institutional finance and substitution of outside finances leads to the less working of credit channel which may lead to the ineffectiveness of interest rate impact on credit demand.

² Report of the Expert Committee to Revise and Strengthen the Monetary Policy Framework, (2014), RBI

But the credit demand aspect has not been explained without which this channel cannot be realized.

There are some empirical works which has been taken this issue of credit view aspect and the economy responding towards the interest rate changes. During the late 80s study by Bernanke and blinder (1988) by taking three assets like money, bond and loans modified the conventional model of substitutability between money and bonds. They stressed on the loan market and built a model where there was the two options to choose either bond or loans according to interest rates. Their model was

$$L^d = L(\rho, i, y).$$

Where L^d is the loan demand

ρ is the interest rate on loan

i is the interest rate on bonds

y is the GNP

Here both the interest rates are negatively related to the loan demand. The dependence on GNP captures the transaction demand for credit and GNP is positively related to the loan demand. The credit demands of an economy mainly depend on the interest rate both in the short and long periods. Because the changes in the different policy rates and interest rate changes will affect the demand conditions of credit and it will affect the productivity and growth of the real economy. Based on this model the credit demand is being modeled in recent research works.

Koivu (2009) examined the sensitivity of interest rates on credit demand in China. The credit demand is nothing but the function of economic output and interest rate:

$$C_t = \alpha + \beta_1 Y_t + \beta_2 INT_t + \varepsilon_t$$

Where, C_t = Non-Food Credit

Y_t = GDP (Gross Domestic Product)

INT_t = Interest Rate

The main reason behind GDP or output on the right hand side indicates that improvement in GDP will lead to increase in income and profit in the future relates to credit demand. An increase in economic output will encourage the future investment in turn increase the credit demand. But, some authors argued that an increase in economic activity could actually reduce

credit demand by increasing firms and households' ability to repay debts. (Bernanke and Gertler, 1995), There is not clear an idea among economists in which way output growth affects lending is a controversial one.

The traditional interest rate channel explained that expansionary monetary policy leads to fall in interest rate, which in turn decrease the cost of capital and will raise investment (Miskin, 1996). When lending rates increase, borrowing becomes more expensive and demand for credit declines. A rise in interest rates may cause investment project unprofitable and discourage the firms to borrow less which will lead to decrease in the demand of bank credit.

KOIVO (2009) found that the Chinese economy has become more sensitive towards interest rate policy. He has studied the response of the interest rate and credit demand relationship and found negative relationship. He also found that there is a significant link in between the lending rate and credit stock, where the interest rate and value-added by industry (as economic output instead of GDP) have been taken as the determinants of credit demand. In the Indian context a downward adjustment in signal rate like Bank Rate becomes more effective, when accompanied by reduction in cash reserve ratio or actions through open market operations.

India as a developing economy where more firms and households are dependent on bank credit indicates the rise of Non-food credit representing the significance of the credit channel. Thus the factors influencing the credit demand are the main focus of this research paper, especially interest rate and its influence on credit demand.

2.4 Literature Review:

Credit markets in India were tightly regulated before 1990s. Bank credit was the main target of monetary policy under the credit planning approach adopted in 1967-68. The Credit market was characterized by credit controls and directed lending. Credit controls included sectoral limits on lending, limits on borrowings by individuals, stipulation of margin requirements, need for prior approval from the reserve bank, if borrowing exceeded a specified limit, and selective credit controls in the case of sensitive commodities. The Interest was administered and credit market was strictly regulated. While commercial banks catered largely to the short term working capital requirements of industry, development finance institutions focused mainly on long term finance. Given the high dependence on bank credit and lack of substitutes for external finance, firms in developing economies are highly sensitive to changes in

the cost and flow of credit. In the pre reform period in India with predominance of largely administered regime of bank credit and interest rates, monetary transmission can be conceived of operating largely through the bank credit channel. There was no role of market based channels during this period, and no scope for a debate over interest rate versus credit channel.

The traditional Keynesian IS-LM interpretation of the monetary transmission mechanism explains that expansionary monetary policy leads to fall in interest rates and lowers the cost of capital, which in turn leads to increase in investment spending causing the aggregate demand and output to rise. Mishkin (1996) argued that the significant feature of the transmission mechanism is the emphasis of real interest rate which affects consumer and business decisions. He also gave importance to long run real interest rate, which has more impact on spending. Monetary policy can still be effective even the nominal interest rate is zero, which is the important part of the discussion by monetarist of explaining great depression where the U.S economy did not stick to the liquidity trap during great depression.

The Impact of monetary policy on the real economy in India operates through various channels. Under the conventional approach referred to as “money view”, monetary policy influences the economy through interest rate. The alternate channel that emphasizes the credit conditions as the route of monetary transmission is referred to as the “credit view”. Bernanke and Blinder (1988) in their celebrated work traced on credit view in which they presented the IS-LM framework augmented with bank intermediate loans. They argued that since loans and bonds are not perfect substitutes, monetary policy operates through the conventional money channel but also through the credit channel.

Bernanke and Gertler (1995) emphasized the credit view in which a change in monetary policy raises or lowers open market interest rates tends to change in the external finance premium in the same direction. There are three reasons for which the credit channel is important. These are credit market imperfections which affect the firms’ employment and spending decision, tight monetary policy hurts the small firms mainly dependent on bank credit and asymmetric information.

Kashyap, Stein and Wilcox (1993) developed a broad theoretical framework to analyze the credit channel of monetary transmission. According to Kashyap et al (1993), tight monetary policy will lead to fall in the quantity of loans simply reflects a decrease in loan demand and not a reduction in loan supply, meaning that there is an inverse relation between the rise in interest rate and credit demand. They argued that the impact of monetary stock operating through the

interest rate channel will reduce the demand for all types of finances, but that operating through the credit channel will lower the loans and other finances.

By taking the data collected in 1987 from a sample of 1389 American small firms, Petersen and Rajan (1994) observed in their regression that the interest rate on the most recent loan on some control variables and two related variables such as the length of the relationship and the number of banks from which each firm borrowed. They found most of the control variables and the length variables are not significant, while the number of banks is having a significant positive correlation with the interest rate. In a 1995 paper, based on 1277 firms drawn from the same sample, they related the interest rate to the age of firm, estimating different age intercepts and slopes for different levels of the concentration Index of the market for deposits, the latter being used as a proxy for the strength of the lending relationship. They found a negative correlation between the interest rates and the firm's age for each level of the concentration index, but the coefficient has a lower magnitude in more concentrated markets.

Gertler and Gilchrist (1994) found that larger firms are likely to increase their borrowing, but small firms faced the problems of borrowings as a result of monetary policy tightening by using the US data. This situation is much more similar to the developing countries in which 'small firms' are more dependent on bank credit due to less developed capital market. Ramey (1993) also followed the same argument of the differences in the credit borrowing of small and large firms due to rise in the interest rates through the monetary tightening. These studies mainly reflect the negative relationship between the credit demand and the rate of interest rate in developed economies as well as developing economies to some extent.

D'Áuria, Foglia, Reedtz (1999) explained the bank interest rate and credit relationship, where they argued that a larger share of credit is related to lower interest rate. The degree of competition in the credit market also significantly affects interest rates, but the impact is very small. Other things being equal, a borrower can expect to pay each bank a slightly lower interest rate if it increases the number of lending banks. They interpreted this result in the sense that some degree of competition does not weaken the relationship with a main/parent bank; it is used by the borrower as an incentive to discourage the relationship bank from extracting a monopoly rent.

Among the four distinct transmission monetary transmission channels, quantum channel has been emphasized in India, with the development of financial markets and closer integration of such markets, the interest rate channel is considered as important. Rangarajan (2001) argued that the impact on output will depend on a variety of environmental factors. The history of industrial growth even in the decade of the 1990s shows that high interest rates did not deter

higher growth in industrial production, when investment demand was high due to other factors. A lowering of interest rates need not necessarily stimulate output. The concept of interest rate impact on output has been argued by the researcher many times in case of India. Zhang and Wan (2002) studied the impacts of household consumption using annual data for 1996-1998. They found that household has been reacting to financial variables and uncertainty since 1985 but a constructing financial system has made inter-temporal allocation of resources difficult.

Qin, Qusing, he and Liu (2005) first estimated equation for monetary aggregates such as M_1 , M_2 and base money by using an error correction model on the quarterly data in the year 1992 in the context of China. However, he did not able to provide any strong proof of link between interest rates and the real economy. Interest rate and the reserve ratios are both treated as exogenous because of their less use in the conduct of monetary policy. Tuuli Koivu (2009) argued that loan demand in China has indeed become more dependent on interest rates. By using the vector error correction model on interest rates and output as the determinant of credit demand, they identified whether the impact of interest rate in China has become stronger over the last year. Finally, they got the result that the Chinese economy has become more sensitive to interest rate policy and there is a negative significant link in between the lending rates and credit stocks.

Two parts of the bank lending channel have been emphasized by Pandit, Mittal, Roy, Ghosh (2006). There is no close substitute for bank loans, both on the asset side of banks' balance sheet and on the liability side of borrowers. Especially, households and small firms lack access to forms of credit other than bank loans. Second, monetary policy changes have a direct effect on money supply. Following a monetary tightening which drains deposits from the banking system, banks have to readjust their portfolios by reducing their supply of loans, c

There are the debates going on regarding the impact of interest rate on the non-food credit on its influence. Because the above literature suggested that some empirical results are representing the interest rate as a determinant of credit demand, while other findings are representing that no such influence of interest rate is there with the credit of commercial banks. Taylor (1995) has an excellent survey of interest rate channel of monetary policy transmission mechanism. He takes the position that there is a strong empirical evidence for substantial interest rate effects on consumer and investment spending, making the interest rate monetary mechanism a strong one. But his argument is a highly controversial one as because many researchers like Bernanke and Gertler (1995) have an alternative explanation that the empirical studies have had great difficulty in identifying significant effects on interest rates through the

cost of capital. Indeed, these researchers see the empirical failure of interest rate, monetary transmission mechanisms as having provided the stimulus for the search for their transmission mechanisms of monetary policy, especially the credit channel. The research paper Monetary policy and bank behavior: empirical evidence from India by S Ghosh (2006) analyzed the transmission of monetary policy shocks in other words interest rate and its relation to the commercial bank behavior. He has taken three variables,

- i. Size of the bank (Natural logarithm of total assets)
- ii. The degree of liquidity (ratio of liquid assets- cash and balance with central bank + call money + investment in govt. and approved securities to total assets)
- iii. Degree of capitalization (the ratio of capital and reserves to total assets)
- iv. Yield of 364 Day T bill as interest rate
- v. Real GDP

The Methodology followed was Generalized Method of Moments (GMM) and the study concluded that the down word Interest rate changes in India during 1992-2004 provided the opportunity to expand the lending of bank credit. The real GDP growth shows the pro-cyclical in credit expansion. The analysis of banks based on size and capitalization results suggests that increase in interest rate by monetary contraction reduce the banks credit expansion. The large banks to some extent manage to protect their loan portfolio in the situation of monetary policy contraction.

An analysis of Economic and Political Weekly (EPW) research foundation shows that higher the interest rate is not creating much problem for the credit growth. This analysis has been done on the basis of recent year data sets from 2010 onwards, which shows that there is an increase in the interest rate but the credit growth is not declining much. There are certain reasons suggested by them for this credit growth are the recent credit demand by an increase in economic activities and the banks are also adopting some alternative ways to handle the additional risk of the credit market. They also suggested that the increases in the deposit growth rates in the banks are incentives for the increase in the credit growth rates. The recent credit growth highlights the increase in credit demand by banks, but there is also the controversy of accessing credit by the firms from the external sources other than banks. It suggests that there have been some changes in the sectoral distribution of credit demand where there may be the increase in the credit demand in different sectors except the industrial sector.

A. Calza, c.gartner and j. Sousa, (2001) modeled the credit demand for loans to the private sectors in the Euro Area and explained the private sector demand for loans in the Euro area. The study has been done on the private sector loan demand and its determinants. It has focused on both the short term interest rate and long term interest rate with the GDP to their effects on loan demand of the private sector in the Euro area. By applying the Johansen cointegration and VECM model, they concluded that there is a reasonable both short term and long term relationship between the loan, GDP and interest rate. The basic argument in this paper is that the determinants of demand for loans are the domestic factors mainly the interest rate and GDP. The result shows there is a significant relationship between the interest rate and GDP.

Bhaumik et al (2011), examined the impact of bank ownership on the reaction of banks to monetary policy from 2000 to 2007. The authors used the average prime lending rate (PLR) of the large banks as a proxy for the monetary policy rate, and estimated the change in loans in response to changes in PLR at the bank level. They found that banks decrease loan supply in response to increases in PLR in tight money periods, and suggest that the bank lending channel of monetary policy is likely to be more effective in tight money periods than in easy money periods. Since the authors used the prime lending rate of banks as the indicator of monetary policy, they implicitly assume complete and quick pass through of changes in monetary policy to bank lending rates, thus missing a potential price response by banks to monetary policy and looking only for a quantitative response.

2.5 Conclusion:

The above review of previous literature vindicates the fact that the relationship of interest rates to non food bank credit is still inconclusive. While analysing this relationships, a few literature explained mainly the response of the changes in the policy rates to the bank credit. But there are many interest rates variables in which banks are considering while setting up their corresponding base rate, which is directly linked to the credit disbursements. The introduction of Benchmark Prime Lending Rate (BPLR) in recent periods has not been strictly followed by the banks. In spite of that, they mainly are arriving at some sub BPLR interest rates. This sub BPLR rate also varies from bank to bank as this rate is computed at the corresponding bank level. As a result of which the credit facility is affected and sometime the actual benefit is not passed to the investors of the priority sectors of the economy. A few literatures also conspicuously not focused on the short term and long term interest rates while analyzing the relationship between bank credit and interest rates. A large chunk of the literature is only concentrated on the relationship between the gross bank credits and its relationship with interest rates and ignoring the response of the interest rates with the sectorial concentration of non food bank credits. These issues are taken up for the analysis in the subsequent chapters.

CHAPTER – III

CREDIT GROWTH, SECTORAL CREDIT GROWTH AND POLICY RATE CHANGES: A TREND ANALYSIS

3.0 Introduction:

The banking sector has become more active in the post liberalized era due to the removal of some restrictions like interest rate determination. Lack of easy access of capital market has also another reason of the growing importance of commercial banks and its lending activities in India. The liberal interest policies by RBI in the post reform period gave an incentive to the commercial banks to lend more. To understand the broad picture of this credit growth in the post reform period, it is not sufficient to know only the overall credit growth of the commercial banks. The overall credit demands of the commercial banks are broadly divided into two parts, namely, food credit and non food credit. The concentration of the non food credit demand in the bank credit is very high in comparison to the concentration food credit. The non food credit demand is also broadly categorized into agriculture and allied activities, industries includes micro, small, medium and large scale industries, services and personal loan sectors. In this chapter, we have confined our analysis to the trend analysis of the responsiveness of interest rate changes to the non food credit demand and sectoral concentrations of non food credit demand in India.

3.1 Trends in Non Food Credit of Commercial Banks:

Scheduled commercial banks constitute three-fourth of the credit market in India. Commercial Banks refer to both scheduled and non-scheduled commercial banks, which are regulated under Banking Regulation Act, 1949. Non-Scheduled Commercial Banks are the remaining banks except the scheduled commercial banks. According to the RBI categorizations, the Scheduled Commercial Banks are grouped under the following categories:

1. State Bank of India and its Associates
2. Nationalized Banks
3. Foreign Banks

4. Regional Rural Banks

5. Other Scheduled Commercial Banks.

Scheduled commercial banks capture the major portion of the credit market of India. These banks are the principal source of financing capital to both private sector and government enterprises. They also play a greater role in sharing the resources between private and public sectors by providing a major portion of credit to the priority sectors such as agriculture, micro, small-scale industries, roads and water transport operators, small and medium business, retail trade, professional and self-employed persons, states sponsored organizations for SCs and STs, education, housing, consumption loans, micro credit, loans to software and food and agro-processing sector. Banks are the major player on Credit market which plays an important role in the monetary transmission mechanism also.

Less developed financial system and complexity of the procedure of lending forces the firms to predominantly dependent on commercial bank credit to finance their operation. There are big numbers of the small and medium enterprises in the industrial and services sectors in India primarily dependent on bank credit mainly because they are unable to access the capital market for their stock requirements. The money supply process changes through the changes in the policy rates, which affects the reserve capacity of the banking system and credit creation of the money banks.

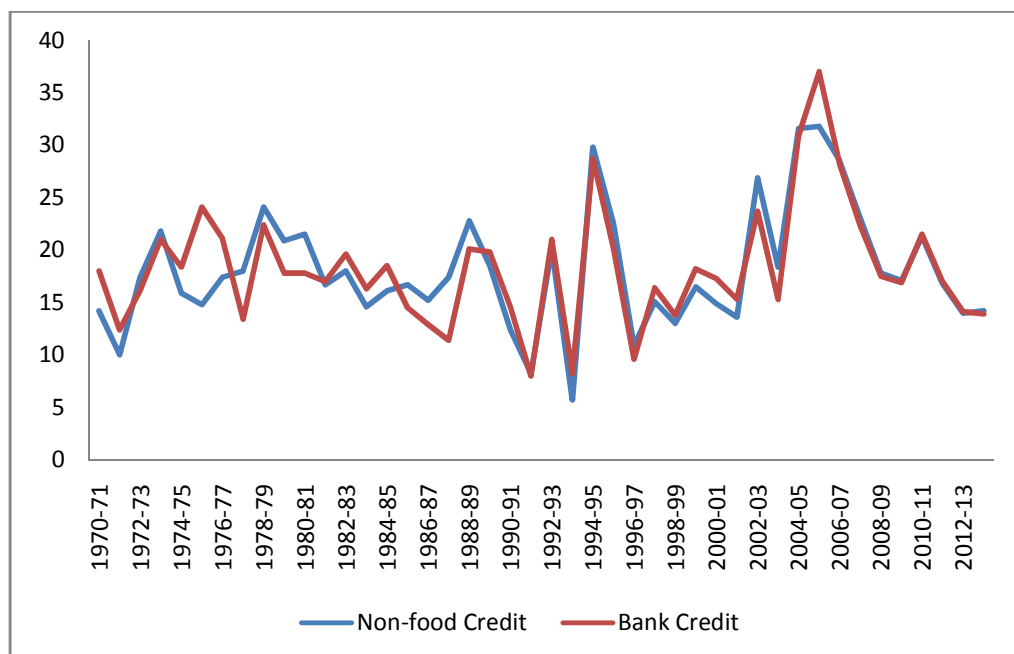
Credit growth of commercial banks in the period of the nineties was very less. However, it has taken a significant movement post in 1995; however, during the period of 2001, it has started contracting. The causes of this are twofold emanating from both the supply as well as demand side factors. The primary supply side factors were the introduction of prudential norms relating to income recognition, asset classification and provisioning in the mid-1990s. On the other hand, the demand side factors are the speedy enlargement of industrial sectors in the initial period but it sharing in the former 1990s. It involves the credit demand and as a result of which, it started going down.

During the period of 1997 to 2002 there was a slow credit demand phase and the Reserve Bank of India realized the importance of raising the credit demand in order to increase the economic growth. RBI adopted the liberal policy of reducing the CRR and increases the bank rates to increase the capacity of the banks to lend more. But the credit growth did not pick up to an expected level. Another reason was also that reducing the nominal interest rates and declining inflation led the real

interest rate to increase. This phase of credit expansion was less as compared to the initial reform period. During 2003-04, credit growth started rising and it became robust from 2004 to 2007 at a rate of 30 percent. This increasing trend of non food credit growth has been shown in the chapter III-1 below. The non-food credit percentage growth in 2003-04 has become more than the overall credit growth. This time was once again the increasing growth of the credit demand period of the Indian economy after 1995-96 financial years. Indian economy once again started recovering and major economic variables became stronger in the sense of macroeconomic balance than earlier periods. Non-food credit growth in this time witness many factors of increasing economic growth, flexibility in the interest rate determination.

Among the several factors of this credit expansion after 2003, the major factors are increasing economic growth, improve on asset quality of credit institutions, moderation in inflation and inflation expectations, decrease in real interest rates, rising income of households and increase competition with the entry of new private sector banks. The project financed by banks and removal of restriction on credit also contributed to credit expansion. Once again the credit growth slowed down in 2008-09. Credit growth decreased to around 15 percent and it led to the slowing down of Indian economy with falling growth rate. The growth of the economy has also influenced on the credit demand cannot be denied which is a very risky situation for the credit demanding sector resulted in falling credit demand. The starting of the subprime lending crisis period, was responsible for this. It continued till now and gradually recovering to previous level. The strict policy approach by the RBI in the post crisis period was also the main factor behind the low credit demand in the economy. The contractionary monetary policy increased the interest rate, which made the credit of commercial banks more costly and the credit demand started decreasing. After 2012-13 economic growth of India is rising and it is having a positive impact on the credit demand. In addition to that the expansionary monetary policy by the RBI helped a little rise in credit demand.

Figure III.1: Percentage growth rate of non-food credit:



Sources: Reserve bank of India

3. 2 Interest Rate Issues and Policy Changes:

Central bank of India has always given importance to the macroeconomic stability and growth process through the different policy alternatives adopted by him. In order to achieve the target of growth and development of the Indian economy, RBI has preferred many monetary policy decisions with the introduction of new policies and financial regulations to make a more productive investment by fulfilling the financial needs of the investors.. Macroeconomic stability, which is the primary challenge, has also been the main aim of the RBI in recent periods. In this process of financial stability with providing help of these financial requirements of the economy, commercial banks' role cannot be ignored. RBI regulates the economy by its different policy rates and monetary instruments through the monetary contraction and expansion mechanisms. Bank rate, SLR, CRR were the traditional weapons for credit control of the Reserve Bank. Increasing these rates implies a contraction in the monetary policy of the RBI, which makes the money market tight by lowering the lending capacity and credit become costlier. On the other hand, when the bank rate is declined, the credit becomes cheaper and more money will flow to the economy lead to the generation of more

credit lending capacity of the financial institutions in the economy. Central bank of India has not preferred frequent changes in the policy rates due to the reason for avoiding the risk occurrence and undesirable circumstances and unstable macroeconomic conditions of India. Many times it has been seen that an increase in the policy rate had created some announcing effects and psychological pressure of the financial institutions.

After the liberalization of Indian economy and the removal of many restrictions such as a administered interest rate mechanism, market forces determine the rate of interest. The rate of interest as a variable is having its importance because of its intermediate role in the equalization of demand and supply of funds in different sectors of the economy. The importance of interest rate channel is much more on the monetary policy measures. To maintain a good policy decision with respect to interest rate has always a challenge for the central bank. Interest rates are the instrumental variables and indicators because they are both input and output of monetary policy decisions (Weber et al. 2007). Chakravarthy Committee Report (1985) emphasized the impact of the interest rate variables in the different economic variables and their role in the generating growth of the economy. The Need of the suitable interest rate policy of target for the monetary management instrument has been realized by the RBI. For the efficient allocation of investment through the interest rate, where the interest rate has been playing an effective instrument in the process of mobilization of saving to investment (Warren and Deena, 1980). The monetary authority should give emphasis on such kind of interest rate, which is much more supporting the mobilization process of saving and investment.

Post reform periods of Indian economy witnessed a financial sector reform with a new institutional set up in the transitional phase brought new challenges for the monetary authority and their financial management process. Their categorization of monetary policy instruments has been done in the name of direct and indirect instruments. Repo rate, open market operation (OMOs), standing facilities and market based discount windows which are the purchasing part are the indirect instruments operate through the price channels. RBI managed the market liquidity process through the repo rate for selling the securities and Reverse Repo rate for buying the securities. In addition to that Repo and Reverse Repo rate became important instruments for the interest rate management mechanism by RBI. With the market determined interest rate of the securities phase of the Indian economy, both the Repo and Reverse Repo became the effective instruments for interest rate control mechanism and money supply controlling process. In the connection of these instruments,

the Liquidity Adjustment Facility (LAF) has been introduced in 2000 supported the monetary control process.

The policy of interest rate instrument became stronger after the introduction of the LAF in the Indian monetary policy frameworks. In 2004, the LAF is functioning with the Repo and Reverse Repo rates with the banks. LAF has played major role in operating in a deficit liquidity situation. LAF has been expanded in different dimensions from 2011 onwards and one among them was the Weighted Average of Call Money Rate (WACR) became the operating target of monetary policy. In the process of these transitions the liquidity management system of RBI became stronger due to the effective interest rate management mechanism with the introduction of new interest rate instrument in the monetary policy framework.

Prime lending rate (PLR) is one of the important interest rate mostly used by the commercial banks in the lending process to their creditworthy borrowers, which was later replaced by a new interest rate named as Benchmark Prime Lending Rate (BPLR). It has been seen that the banks are not following PLR much in their lending activities and most of the lending process is being done through the sub-BPLR. In March 2007 the portion of sub-BPLR increased to 82 percent. The trend analysis of the BPLR shows that there is the downward trend in the BPLR. The banks are keeping the BPLR unchanged by altering the margin below the BPLR in respect of market conditions at the time of change in the policy rates especially when a decline in policy rates. Major lending activities are being done through the sub-BPLR by banks with several interest rate alternatives like commercial papers, WACR, certificate of deposits for managing the proper lending activities. But, major banks mainly advertise to charge the PLR in the lending credit is not being used.

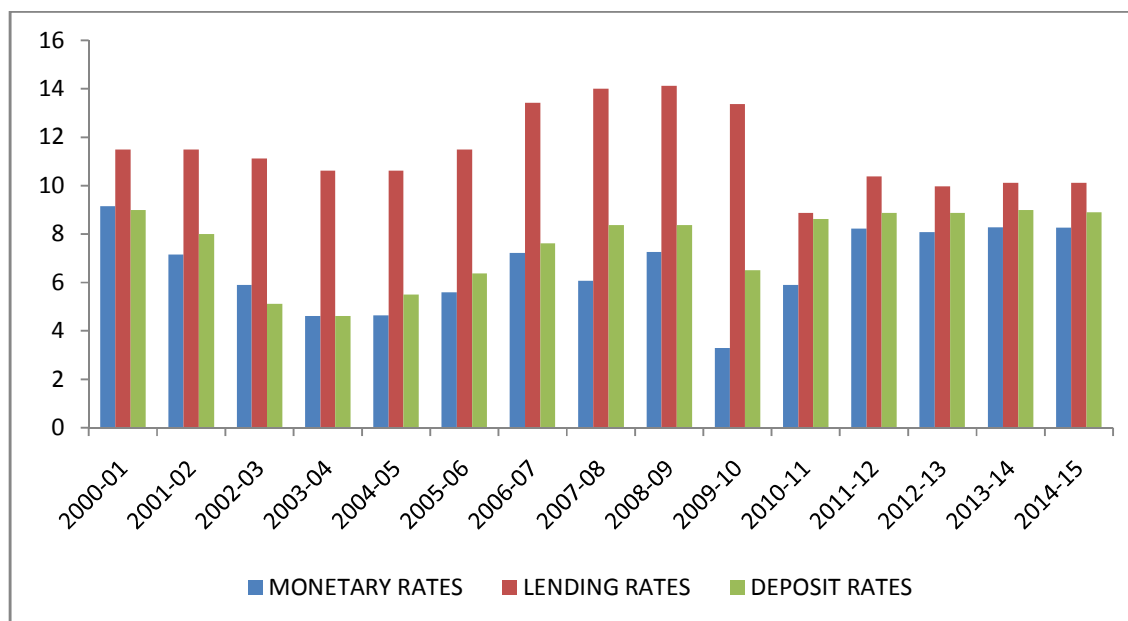
The Base Rate system was introduced by RBI and became effective from July, 2010 for making a better transparency of the different interest rates and lending rates of the banks with proper function of the transmission mechanism of the central bank's monetary policy. The Base rate of the banks became the minimum rate in which they can do their lending activities in a better manner and helpful for reducing the risk of lending credit to the borrowers. Banks are expected to 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 is made up of fixed interest rate versus variable interest rate products. With a higher share of outstanding variable rate loans that are benchmarked to the base rate, a bank's future stream of interest income will vary more with changes in the base rate and banks calculate their base rate taking their cost of funds, the 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. The fact 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 is made up of fixed interest rate versus variable interest rate products. With a higher share of outstanding variable rate loans that are benchmarked to the base rate, a bank's future stream of interest income will vary more with changes in the base rate. Chapter IV of the Patel Committee Report (RBI 2014) discusses likely impediments to monetary transmission in India and provides exploratory evidence of an asymmetric effect of the policy rate on deposit and lending rates in India.

The RBI has expressed the issue regarding the lack of policy rate pass-through to lending rates and deposit rates, and certain changes to the monetary policy operating framework have been implemented with the aim of improving transmission. Recent RBI monetary policy statements mentioned that pass-through of past policy rate cuts to lending rates as a prerequisite for further monetary easing (March 4, 2015), and discuss lending rate sensitivity to the policy rate (April 7, 2015).

The chart III.2 shows the trends of money lending and deposit rates. The monetary rates were lower and the lending rates were more due to certain factors of sound economic performance of that period. It also reflects that that the low lending rate indicates less costly and inverse relationship among them. After 2009-10, the lending rates started declining and the interest rate started rising during the crisis periods. This period lending became less due to the increasing price of the credit as a result of the rise in the monetary rates pushing the interest rate to increase upward. The interest rate policy of that time and the rise in the interest rate charged by banks in this period shows the interest rate effect and responsiveness bank credit demand.

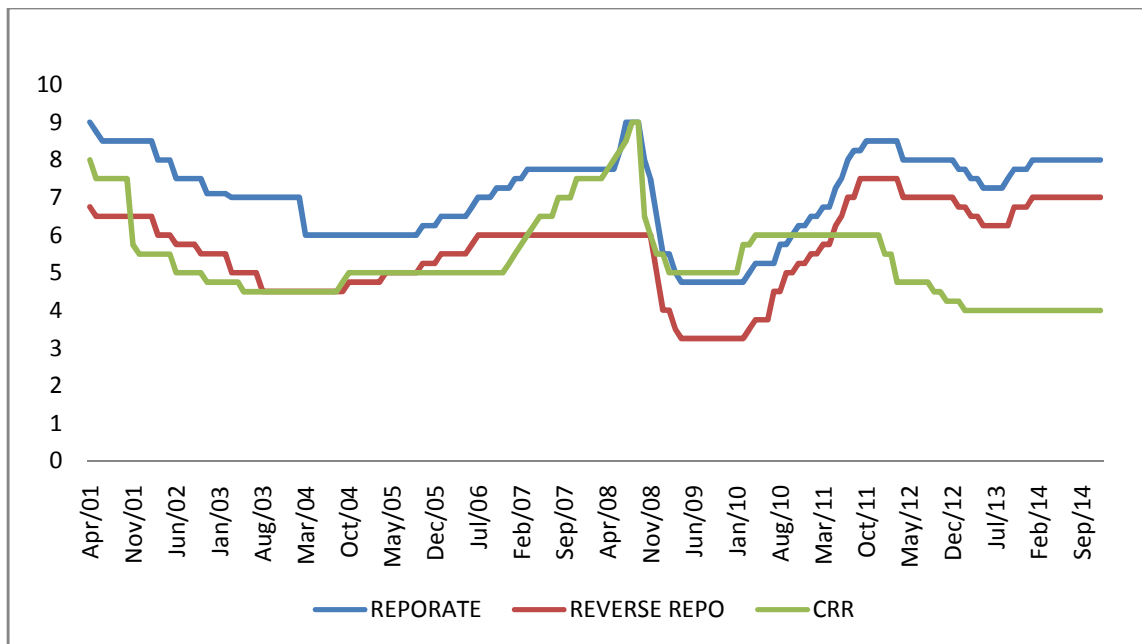
Figure III.2 Trends of different rates



Sources: Reserve bank of India

There was a contractionary monetary policy adopted by the monetary authority of India in that period. During 2007 repo rate and CRR increased to around 10 percent, which was highest in the decade and led to the increase in the interest rate and bank credit, became costly. This was the result that the lending growth of the commercial banks declined in 2008 onwards. This would be seen clearly from the Chart. –III.3. Thus, one thing is clear that when there are the changes in the policy rates it affect to the interest rate variable of the economy and the lending capacity with the investment of the economy. The overall analysis suggests that there is the link between the policy rate changes and its response to the economy through the different form. The main variable in the economy changes is mainly the interest rate whether it may be in different forms. Therefore, it cannot be denied that the interest rate policy followed and charged by the private sector banking is affecting the credit demand of the economy and also the output, employment and growth.

Figure III.3 Trends in Major monetary Policy Rates:



Sources: Reserve Bank of India Database on Indian Economy

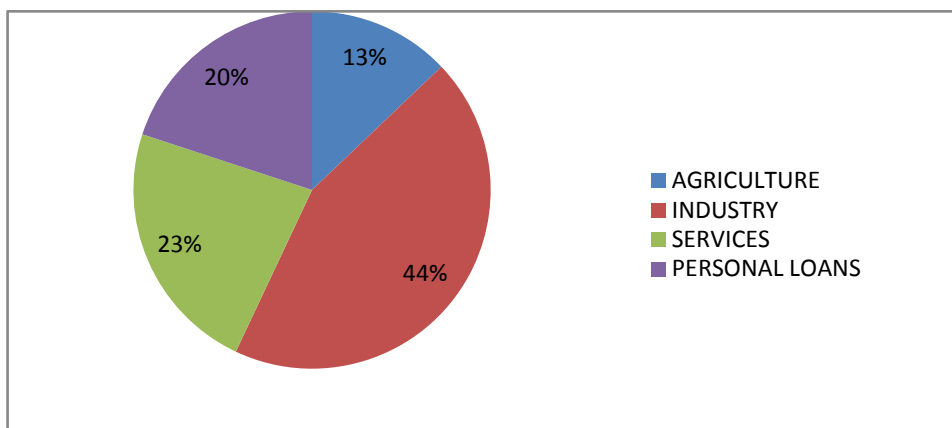
3.3 Sectoral Distribution of Non-Food Credit of Commercial Banks:

Bank credit comprises of both food and non-food credit and the major share of bank credit come under non-food credit which is 98 percent in the march 2015. The main four sectors credits are the industry, agriculture, services and personal loans. Among these main four sectors there are some sub sectors which come under these individual sectors. The importance of sectoral distribution is more because it will provide the broad picture of the trends in credit growth in different sectors with sub sectors and it would be helpful to understand a particular sectors growth or decline.

The Chart III-4 shows the percentage share of the non-food credit comes under different sectors of the economy. Industrial sector constitutes the highest portion of the non-food credit, which is more than forty percent and the service sector credit demand is the second highest, around 23 percent. The personal loans and agricultural sector demands are 20 percent and 13 percent respectively. Thus, it is clear that most of the non-food credit of the commercial banks goes to the industrial sector of the economy. While the agricultural sector covers the lowest percentage of credit share, it means that the credit demand in the rural area is less because there are many problems of

lack of awareness, limited bank branches, banking habits of people. The major portion of the industrial credit in non-food credit signifies the on dependence on the commercial bank credit by the productive sector of the economy. The changes and it main reason will be clear when we would go through the trend in the non-food credit to the commercial banks.

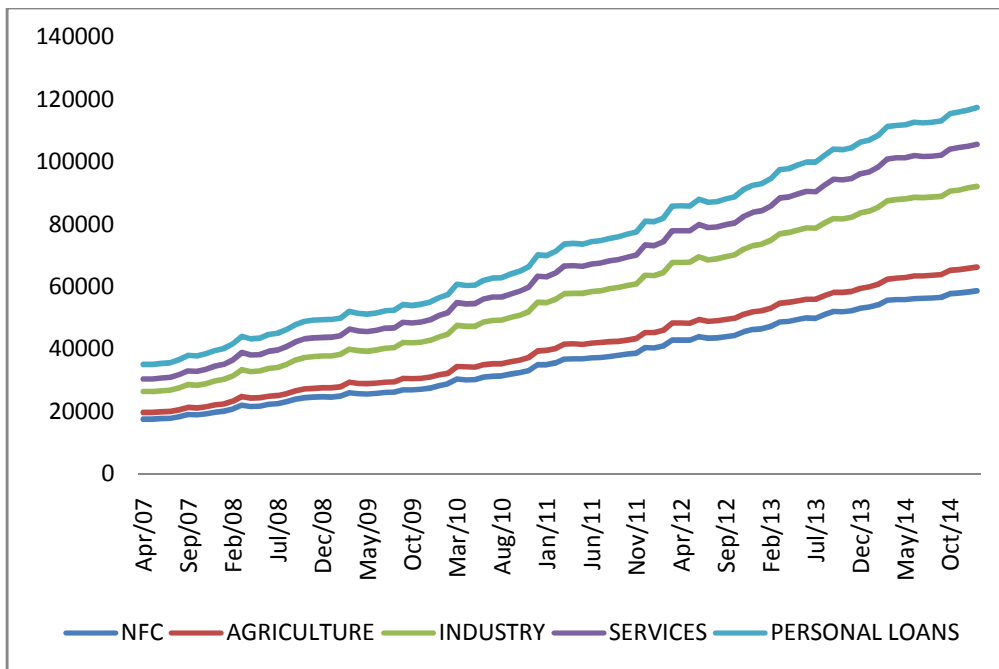
Figure III. 4 Percentage share of Sectorial Distribution of non -food credit:



Source: Reserve bank of India, complied author

The actual growth of bank credit has always been the increasing trend. Whenever the economy is facing the anything like a crisis or slowdown, it has not impacted the actual credit demand to be the less than the previous periods. If we see the actual trends of non- food credit with the different sectorial credit lending by banks as shown in Chart III.5 below, they all are in the increasing trend. The credit growth up to 2006-07 was high, but the crisis period led to the decrease in the credit demand. Even then also the actual credit demand has not declined in the periods of 2007 onwards can be observed from the chart. This chart does not clearly show the increasing trend because these lines in the chart are the line of showing the actual amount of credit demand. In order to do some broad observation, we can refer to the chart III.6. This chart is showing the percentage share of credit trends of different individual sectors in total non-food credit.

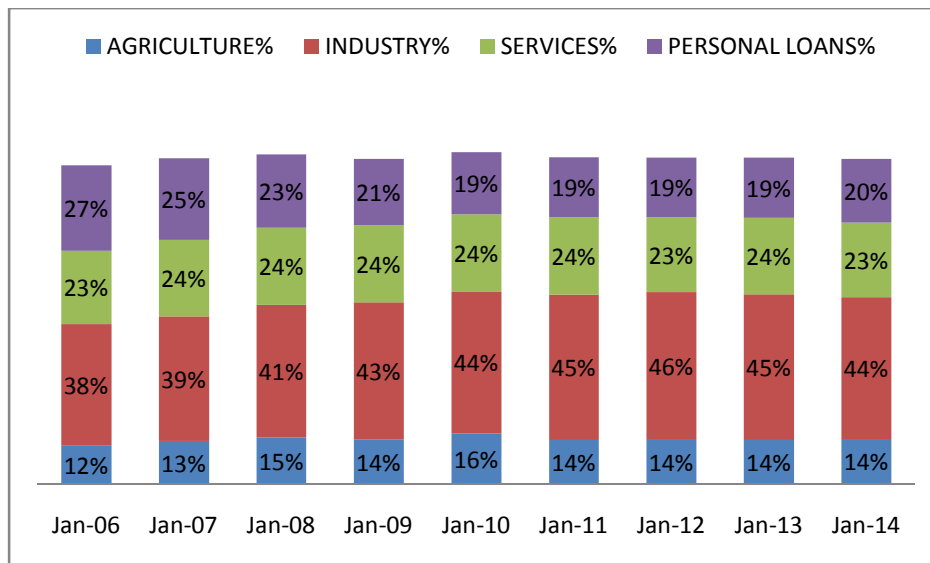
Figure III.5 Increasing Trends of sectoral Non-food Bank credit



Sources: Reserve Bank of India

The percentage bar of the different sectors shows that there was the decline in the personal loan demand and the agriculture and service sector remained same. There was the growth in the industrial sector in the total share of non-food credit. It indicates that the post crisis period, was having high interest rate, increase in risk and economic slowdown were the main determinant of it.

Figure III.6 Percentage increase in share of sectoral credit (2006-14)



Source: Reserve Bank of India

The percentage share of the different individual sectors has been depicted in the above chart no III.6. The percentage share of the industrial sector credit growth has increased from 38% to 44% from 2006 to 2007 despite the periods of the crisis in 2007. Similarly, agricultural credit increase from 12% to 14%. The credit demands of the service sector remain same over this period. The retail sector lending decreased from the 27% to the 20%. The basic reason behind the decrease in the retail credit of the personal loan decrease due to the impact of crisis periods, which created the consumption capacity of people. The overall analysis of the percentage share reveals that the industrial and agricultural sector share has not declined, but the retail sector's share of commercial bank credit in total credit has declined.

The post reforms period credit growth moved through a discontinuous process. The major reason behind this can be analyzed through the sectoral analysis. The different sector credit demand will reveal better the problems of understanding the reason behind the credit expansion and credit contraction. Both the phase of post 1990s and last decade witnessed the changes in the credit demand pattern of different sectors in a different manner. The changing structure of the economy also contributed more to the changing pattern of credit demand by different individual sectors. The credit flow during pre and post crisis period of 2007 can be analyzed and it would also give a better understanding of the sectoral changes of it.

3.3. A. Agriculture:

The agricultural sector has always been neglected by the commercial banks in financing credit facilities. There are several reasons behind the less intention of providing credit towards the agricultural sectors. If we analyze the history of post independence periods the problems can be understood clearly. For the first time in 1966 all India Rural Credit Review Committee was set up to review the supply of rural credit and to recommend for the providing more credit facilities to the agricultural sector. With this review, the committee also recommended that the commercial banks also have to play a major role with cooperative institution for providing credit to the agricultural sector. After this committee review following the Indian banking sector reforms in 1969 the concept of priority sector lending was introduced to enhance the credit facilities to the many neglected sectors like agriculture. After the bank nationalization once again the agricultural sector lending did not pick up to the targeted level and it was mainly due to the inability of the commercial banks to finance the agriculture. After 1970s Regional Rural Banks (RRBs) and National Bank for Agriculture and Rural Development were set up and the flow of agricultural credit started rising. Setting up the Rural Infrastructure Development Fund (RIDF) by NABARD which was mainly funded by the scheduled commercial banks achieved the target of providing credit to agriculture in the post reform periods. The initial post reform periods credit flows from the scheduled commercial banks were in the industrial sectors, but later agricultural credit also improved subsequently.

The credit demand of agriculture in the post reform period from 1990s to 2001 has declined from 15.9 percent to 9.6 percent. This period is also witnessing the decreased in the share of agriculture in GDP. Due to this condition, the Government of India and RBI¹ took different policy decisions to increase the flow of credit to the agricultural sector. These were,

- Rescheduling of short-term loans to medium and long term loans
- Higher target fixed under the Special Agricultural Credit Plans of public sector banks and making it applicable to private sector banks
- Advising banks to double the flow of credit within three years, starting from 2004-05.

Agricultural credit started rising from 2007 onwards. The share of agriculture to total non-food credit was 13 percent in 2007, which has increased steadily from 13 percent to 43 percent in 2014 equal to more than threefold increase in credit. A different policy decisions by RBI before 2007

¹ Report in currency and Finance, RBI 2005-06

played a main role in the rise of agricultural credit in this period. The growth in cooperative banks lending, leads to increase in the sectoral credit shows that the only sector which has rapidly grown in the recent years is the agriculture. The agricultural sector lending has always been given less preferable by the private sector banks and the discounted interest rate create disincentive for lending. Thus, the interest rate changes have not the systematic effect on the agricultural sector lending and credit demand.

3.3. B. Industry:

Credit demand growth of the industrial sector in 1990s was 16.4 percent, whereas in 1980s, it was slightly more than this (16.7) percent. It declined in the next decade to 15.8 percent. The share of total bank credit is 38.8 percent in 2005 as compared to 48 percent in 1990s. Even if the introduction of commercial papers, shares and debentures increased the credit flow initially, but later declined later.

In the post reform period industrial growth, but the increased but the credit demand of the industrial sector from the banks declined mainly because of the more reliance on the external sources and dependent on the capital market. The less dependence of the industrial sector on bank credit led to decline in its the share in total non-food credit from 54.3 percent of bank credit to 39.1 percent in 2004-05. Credit intensity of the industrial sector has increased in the post reform periods. The percentage share of small and medium credit to industry out of the total credit banks in the industrial sector increased from 17.5 percent in 1995 to 47.6 percent March 2005. Short-term credit intensity has also increased in the last decade.

The crisis periods of 2007 has led to the decline in the credit in different sector. But, the industrial sector growth has not slowed down much. The percentage share of the industrial sector in the total non-food was grown and can be seen from Chart. III. 6. The percentage share in 2007 was 38 percent and it is increased to 44 percent in 2014. The interest rate policy in this period was very much rising upward and borrowing became costly. This post crisis period witnessed the rising interest rate and costly loans prices for borrowers, but the industrial sector credit has not declined. Here the interest rate has not affected much of the industrial sector lending. The recent periods introduction of prudential norms which have reduced the risk also have given incentive to the private sector banks to lend more. The banks always give more preference to lend more to the industrial sector because of the most productive sector of the economy and less risk of loss and

problem in repayment. Therefore, the response of the interest rate is not so much systematic in this sector also. But, it cannot be rejected that there is no interest rate effect because the pace of growing trend has declined in compared to previous periods of 2005 as compared to the post crisis periods.

3.3. C Service Sector:

The contribution of the service sector has always more on the GDP in comparison to the concentration of agriculture and industrial sector. Presently it is more than 60 percent after 2005-06. But it was the time in 1990-91 the share of the service sector to GDP was only 46.7. There is the rapid increase in the share of the service sector in GDP in the post liberalized period indicates the expansion of the service the sector. With the expansion of service sector the credit given to it has also accelerated after 2005-06. The share of the service sector in total bank credit has increased from 30.9 percent in 1990-91 to 48.7 percent in 2005-06 which was reflecting the increasing share of the service sector to the total GDP. The credit intensity of the service sector has also increased in the recent periods. The credit intensity of the service sector in 1990-91 was 14.9 percent, which has increased to 15.2 percent in 2001. The credit intensity of service sector surprisingly increased to 36.5 percent in 2006. This can be seen from Chart IV.5 that the recent period's credit growth in 2012 to 2014 has increased much more. As compared to the other sector the service sector, is growing fast and the major reason behind this is a sharp rise in credit demand of the household sector. There is also the major reason of increasing the trade activities, tourism, wholesale trade, commercial real estate and increasing NBFCs growing activities in the liberalized market. The interest rate policy in the post crisis period has very restrictive, but it has not affected very much in the credit demand of the service sector as the credit intensity of the service sector is also increasing.

3.3. D Personal Loans:

In the early 1990s, there were certain restrictions on disbursing the personal loans. There were restrictions in different forms like limits on the granting loans by a bank, limits to lend loans to a person, different interest rate on the loan size and prescription of the maximum periods of repayment. All the restrictions had been removed in the post liberalized periods. Due to the relaxation of these restrictions had a positive impact on the increase in the credit of the bank credit. After 1995 personal loan increased rapidly. In post 1990s the personal credit grew by 25.2 percent, while it became 38.2 percent during 2005. The overall credit up to 2005 was 20.3 percent. The share of the personal loan increased to 22.2 percent in 2005 from 14.4 percent in 2000 respectively from

9.4 percent in 1990s². The housing loans constitute one half of the of the total loan of personal credit. Housing loan increased by 47.7 percent during the five year period from 2000 to 2005. The average housing loan has increased four times from 2001 to 2005 and in this period the private sector banks were very aggressive for lending housing credit. As a result the share of personal loan in total credit of both the private sector bank and foreign banks reached almost the same level. This phase of post liberalized period up to 2004-05, the growth of personal loan increased at a high rate.

However, if we see the percentage share of the housing loan, it started declining from 2007 onwards. During the crisis periods of 2007 and onwards the percentage share of personal loan on total non-food-credit declined to 19 percent in 2010 and remained constant up to 2012 can be better observed from Chart.III.6. After 2012, it has started rising very slowly. The overall picture of the personal credit suggests that there was a sharp rise in the personal credit before 2007. The main reasons behind this are the increasing economic growth with job opportunities, IT sector expansions, tax incentive offers to the salary earners, which made housing loan more attractive by declining the effective interest rate. Even if the interest rate keeps on changing in this period, but there was no such interest rate effect on the personal loans. While in the post crisis periods of 2007 onwards the credit demand declined due to slow economic growth rate, higher risk of lending by banks and also increase in the interest rates. Thus interest rates effectively respond in the recent period as compare to 2005. Thus, when demand for loan is more the interest rate is not affected.

3.4 Conclusion:

Bank credit is the main source of the financial support for the economic growth in the developing economy. The less developed capital market and access to it in developing countries leads to the more dependence on the banking sector for their financial needs. The monetary authorities of these economies also try to control the private sector banking through their policy rates. Indian economy faces similar kind of situations. The trend analysis in the above section reveals the broad picture of the credit growth, interest rate issues and policy changes by RBI. There are the major changes in the credit demand in the different time periods after 1990s. There are issues regarding the credit growth suggest that there are certain changes and different kinds of response to the credit demand in the

² Basic statistical returns of commercial banks in India, various issues, Reserve Bank of India

economy, according to the respective time periods and economic situation faced by the economy. The credit growth in the post reform period spanning from 2000 to 2005 experienced the rapid expansions. But later period trends show the decline in non-food credit.

The interest rate issue of the commercial bank was the main issue with the slowdown in economic growth. The interest rate was lower in early 2000s, and Indian economy was growing which induced the private sector banks to lend more. But, later in crisis period credit demand declined with increasing interest rates and contractionary monetary policy decisions. Banks do not determine their interest rate based on the BPLR and following the sub BPLR interest rates. It means the banks are many times opting different interest rate methods to determine their interest rates. Opting different interest rate except BPLR by banks leads to the different interest rate changes according to the time which create problems in the lending process and the response of the interest rate mechanism in the economy become weak. It means the monetary regulatory authority faces the problem in stabilization of the money supply process with other economic variables. The sectoral non food credits give a broader picture to supplement for more information regarding the interest rate issues and some other determinants of credit demand. The industrial, service and personal loan sectors are more sensitive to the interest rate changes. There are the issues regarding the impact of interest rate policy changes and its effect on individual sector and its growth trends, but overall analysis suggests the interest rate response to the credit demand.

The trend analysis reveals some of the important factors and determinant behind the demand for bank credit. The major determinants are the economic growth and interest rate changes. The growth rate of the economic output and its impact on credit demand is having no any issues. The main problem is the interest rate problem, which is due to the existence of the several interest rate variables such as Sub-BPLR rates and their impact on the credit demand. Commercial banks are not having any one particular interest rate variable or sub BPLR to follow. Alternative interest rate mechanism followed by the banks leads to the problems in the credit pricing system.

CHAPTER- IV METHODOLOGY AND EMPIRICAL FINDINGS

4.0. Introduction:

Commercial bank credit is the important source of finance for the economy in India. Theoretically, credit flow of commercial banks depends upon the several determinants. The interest rate is the important determinant among them. The theory behind the interest rate and the commercial bank credit suggest that the interest rate and the credit demand are inversely related. When there is an increase in the interest rate, the credit demand of the commercial banks will decline and decrease in the interest rate will lead to the increase in the credit demand. In this chapter, we empirically estimate the relationship between the change in the interest rate and commercial bank credit. The empirical analysis based on both the time series and panel data analysis. To study the overall non-food credit demand and interest rate relationship, the time series model can give better result. In order to study the relationship of credit demand relating to the individual sectors of non-food credit of commercial bank and interest rate, the panel data technique is the suitable method to follow.

4.1. Methodology of the study:

To examine the relationship between interest rates and commercial bank credit demands, we have employed time series analysis and methods, such as Johansen's cointegration test, Granger's causality test and Vector Error Correction Model. The second section of the study follows the panel data analysis to examine the relationship between sectoral distribution of the non-food credit and interest rates.

4.1.1 Methodology of Time Series:

To start with, the study is based on a four variable Multiple Regression model where the commercial bank credit is a function of the economic output, and short term as well as long-term interest rates. In the case of economic output, we have considered the Index of Industrial Production (IIP), because the monthly data on Gross Domestic Product in the context of India is not readily available. To represent the short-term interest rate, we have considered the repo rate (REPO) and for long-term interest, the yield on 364-day Treasury bill can be considered. The Regression model is as follows:

$$Credit_t = \beta_1 + \beta_2 y_t + \beta_3 ints_t + \beta_4 intl_t + e_t \quad \dots\dots(4.1)$$

In the above equation y_t the economic output (IIP). The ‘ints_t’ refers to the short term interest rate (Repo rate). The ‘intl_t’ is the long-term interest rate, (Yield on T-364 day).

4.1.1.1. Unit Root Test:

As our study based on the time series data, to start with, we have considered the Unit Root test for the considered variables in order to avoid the spurious regression. A stochastic process said to be a weak stationary, if its mean, variance and autocovariance at different lags are time independent. To explain this process briefly,

Let Y_t be a stochastic time series being represented as $Y_1, Y_2 \dots Y_t$ and the mean and the variance of the process at time t is given as:

$$\text{Mean } \mu = E (Y_t) \dots\dots\dots (4.2)$$

$$\text{Variance } (Y_t) = E (Y_t - \mu)^2 = \sigma^2 \dots\dots\dots(4.3)$$

Similarly, the covariance between Y_t and Y_{t+k} is given by

$$\text{Cov } [Y_t + Y_{t+k}] = \gamma_k = E [(Y_t - \mu) (Y_{t+k} - \mu)] \dots\dots\dots (4.4)$$

Where $k = 1, 2, 3 \dots t$, γ_k , the covariance (or autocovariance) at lag k , is the covariance between the values Y_t and Y_{t+k} , that is between two Y values K periods apart. If $K=0$, we obtain γ_0 , which is the simply the variance of $Y (= \sigma^2)$; if $K=1$, γ_k is the covariance between two adjacent values of Y .

Formally, the series Y_t is said to be stationary, if the following conditions are satisfied for all m :

$$E (Y_{t+m}) = \mu \dots\dots\dots (4.5)$$

$$E (Y_{t+m} - \mu)^2 = \sigma^2 \text{ and,} \dots\dots\dots(4.6)$$

$$E [(Y_{t+m} - \mu) (Y_{t+m+k} - \mu)] = \gamma_k \dots\dots\dots(4.7)$$

The above conditions are known as the conditions of weak stationary. For most of the applications, these are the conditions required in the time series literature.

4.1.1.1.1. The Augmented Dickey Fuller (ADF) test

Dickey and Fuller (1979) considered three different regression equations that can be used to test the presence of a unit root:

$$\Delta Y_t = \gamma Y_{t-1} + \varepsilon_t \quad \dots\dots\dots (4.8)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \varepsilon_t \quad \dots\dots\dots (4.9)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \alpha_2 t + \varepsilon_t \quad \dots\dots\dots (4.10)$$

In the above specifications, the difference between the three regressions concerns the presence of the deterministic elements α_0 , $\alpha_2 t$. The first is a pure random walk model, the second equation adds an intercept or drift term, and the third equation includes both a drift and linear term trend. The parameter of the interest in all the regression equations is γ ; if $\gamma = 0$, the $\{Y_t\}$ sequence contain a unit root. This involves estimating one or more of the equations above using OLS in order to obtain the estimated value of γ and associated standard errors. Comparing the resulting t-statistics with the appropriate value reported in the Dickey Fuller tables allows to determine whether to accept or reject the null hypothesis $\gamma = 0$.

In conducting the Dickey Fuller test as in equation 4.8, 4.9 and 4.10 were assumed that the error term ε_t was uncorrelated. However, in case, the error terms ε_t are correlated, Dickey and Fuller have developed a test, known as the Augmented Dickey Fuller (ADF) test. This test is conducted by augmenting the preceding three equations 4.8, 4.9 and 4.10 by adding the lagged value of the dependent variable ΔY_t . The ADF test may be specified as follows:

$$\Delta Y_t = \alpha_0 + \alpha_2 t + \gamma Y_{t-1} + \beta_1 \sum_{i=1}^k \Delta Y_{t-i} + \varepsilon_t \quad \dots\dots\dots (4.11)$$

Where ε_t is a pure white noise error term and where Δ is the difference operator, γ and β are the parameters. In the ADF test we still test whether $\gamma = 0$ and the ADF test follows the same asymptotic distribution as the DF statistic, so the same critical values can be deterministic components included in the regression equation. Without an intercept or trend uses the τ statistic; with only the intercept, use the τ_μ statistic; and with both and intercept and trend, use τ_τ . The statistic τ , τ_μ and τ_τ are the appropriate statistics to use the equation 4.8, 4.9 and 4.10 respectively. The DF test forms a special case of the ADF test when the summation part on the right hand side of the equation (4.11) is the deleted or when $k = 0$ [Dickey Fuller (1979)]. For

ADF test, the value of the k is determined based on the Akaike's Information Criterion (AIC) and Final Prediction Error (FPE) criterion.

4.1.1.1.2. Phillips- Perron (PP) test

The distribution theories supporting the Dickey Fuller test assume the errors are statistically independent and have a constant variance. Phillips and Perron (1988) developed a generalization of the Dickey Fuller procedure when the above assumption is relaxed. The advantage of this test is that it is neutral to the lag length in the ADF equation.

The statistics proposed by Phillips and Perron (1988) termed as 'Z' statistic; arise from their consideration of the limiting distributions of the various Dickey Fuller statistics when the assumption of that the disturbance term is an IID process is relaxed. The advantage of the test is that it is neutral to the selection of the lag length in the ADF equation. Further, the error term over there could be serially correlated and hence heteroscedastic. Let us consider the following equation:

$$Y_t = \alpha_0^* + \alpha_1^* Y_{t-1} + \mu_t \quad \dots(4.12)$$

And

$$Y_t = \hat{\alpha}_0^* + \hat{\alpha}_1^* Y_{t-1} + \hat{\alpha}_2 (t-T/2) + \mu_t \quad \dots(4.13)$$

Where the T = number of observations and the disturbance term μ_t is such that $E \mu_t = 0$, but there is no requirement that the disturbance term is serially uncorrelated or homogeneous. Instead of the Dickey and Fuller assumption of independence and homogeneity, the Phillips and Perron test allows the disturbance to be weakly dependent and heterogeneously distributed. Phillips and Perron characterize the distribution and derive test statistics that can be used to test hypotheses about the coefficients α_1^* and $\hat{\alpha}_1$ under the null hypothesis that data generated by the $Y_t = Y_{t-1} + \mu$. The Phillips and Perron test statistics (Z_α) are modifications of the Dickey Fuller t-statistics that take into account the less restrictive nature of the error process.

4.1.1.2. Cointegration and Error Correction

To avoid the problem of spurious result, which arises due to the non-stationary nature of the data in the time series analysis, cointegration technique came to limelight. Thus, when the variables contain a unit root, modern time series technique of the cointegration is used to establish long run equilibrium relationship among them. In general, cointegration is defined as

the long run equilibrium relationship among the set of non-stationary variables provided their linear combination is found to be stationary.

4.1.1.2.1. Johansen's and Cointegration Test:

The Johansen test for co-integration begins by considering the unrestricted reduced form of a system of variables, which by assumption; can be represented as a finite order Vector Auto Regression (VAR) model.

$$x_t = A_0 + A_1x_{t-1} + A_2x_{t-2} + \dots + A_px_{t-p} + \varepsilon_t \quad \dots(4.14)$$

Where, x_t = the $(n \times 1)$ vector $(x_{1t}, x_{2t}, \dots, x_{nt})'$

A_0 = an $(n \times 1)$ vector of constants.

A_i = an $(n \times n)$ matrix of parameters.

ε_t = an independently and identically distributed n -dimensional vector with mean 0 and variance Σ_ε .

The equation (4.14) can be reformulated into a Vector Error Correction Model (VECM) form:

$$\Delta x_t = A_0 + \sum_{i=1}^{p-1} \pi_i \Delta x_{t-i} + \pi x_{t-p} + \varepsilon_t \quad \dots(4.15)$$

$$\pi = - \left[I - \sum_{i=1}^p A_i \right]$$

$$\pi_i = - \left[I - \sum_{j=1}^k A_j \right]$$

Where I = an $(n \times n)$ identity matrix.

The equation (4.15) contains information on both the short run and long run adjustment to change in x_t , via the estimates of π_i and π respectively. As it is shown in Johansen (1988), $\pi = \alpha\beta'$, where α represents the speed of adjustment to disequilibrium, while β is a matrix of long run coefficients such that the term $\beta'x_{t-k}$ embedded in (4.15) represents up to $n-1$ co-integrating relationship in the multivariate model which ensure that the x_t converge to their long

run steady state solutions. Hence the matrix β is the matrix of co-integrating parameters and α is the matrix of the speed of adjustment parameters.

The key feature to note in (4.15) is the rank of π ; the rank of π is equal to the number of independent co-integrating vectors. If $\text{rank}(\pi) = 0$, the matrix is null, so there is no co-integration among the set of n variables, that means, there is no linear combination of variables that is stationary. Hence the equation (4.15) will become a usual VAR model in first differences. Instead, if $\text{rank}(\pi) = n$, the vector process is stationary, that means there are 'n' linear independent combinations of x_t that are stationary. So in this case all the variables are stationary. In the intermediate case, if $\text{rank}(\pi) = 1$, there is a single co-integrating vector and the expression πx_{t-p} is the error correction factor. For other cases in which $1 < \text{rank}(\pi) < n$, there are multiple co-integrating vectors.

The number of distinct co-integrating vectors can be obtained by checking the significance of the characteristic roots of π . The number of co-integrating vectors is equal to the rank of the matrix π and the rank of the matrix is equal to the number of characteristic roots that differ from zero. The Johansen methodology allows determining the number of characteristic roots that are statistically different from zero. If the variables in x_t are not co-integrated, the rank of π is zero and all the characteristic roots (λ_i) will equal to zero. In practice, one can obtain only estimates of π and the characteristic roots. The test for the number of characteristic roots that are insignificantly different from unity can be conducted using the following two test statistics:

$$\lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad \dots\dots(4.16)$$

$$\lambda_{\text{max}}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad \dots\dots(4.17)$$

Where, $\hat{\lambda}_i$ = the estimated value of the characteristic roots (also called Eigen values) obtained from the estimated π matrix.

T = the number of usable observation.

r = the number of co-integrating vectors.

When the appropriate values of 'r' are clear, these statistics are simply referred to as ' λ_{trace} ' and ' λ_{max} '. The first statistic tests the null hypothesis that the number of distinct co-integrating vectors

is less than or equal to 'r' against a general alternative. It is clear that λ_{trace} equals zero when all $\lambda_i = 0$. The second statistic tests the null hypothesis that the number of co-integrating vectors is r against the alternative of r+1 co-integrating vectors. Johansen and Juselius (1990) provide the critical values of the λ_{trace} and λ_{max} statistics. The estimated values of the above two statistics are compared with the Johansen and Juselius critical value to determine the number of co-integrating vectors exist among the variables. One of the most interesting aspects of the Johansen procedure is that it allows for testing restricted forms of the co-integrating vector (s). One can impose restrictions on the co-integrating vectors or adjustment coefficients, and accordingly conclude whether restrictions are binding or not by using a statistic, which is proposed by Johansen.

4.1.1.2.2. Error Correction Model:

If the test statistics indicate that one co-integrating vector exists, Maximum Likelihood estimates of this vector are given by the first column of β . Hence the VECM representation is given by:

$$\Delta x_t = A_0 + \sum_{i=1}^{p-1} \pi_i \Delta x_{t-i} + \alpha \text{ecm}_{t-1} + \varepsilon_t \quad \dots(4.18)$$

where $\text{ecm}_{t-1} = \beta x_{t-1}$ and $\beta = [\beta_1, \dots, \beta_n]$

Again if test indicates that two co-integrating vectors exist, then the first two columns of β are the maximum likelihood estimates of these vectors, and VECM is given by:

$$\Delta x_t = A_0 + \sum_{i=1}^{p-1} \pi_i \Delta x_{t-i} + \alpha_1 \text{ecm}_{1t-1} + \alpha_2 \text{ecm}_{2t-1} + \varepsilon_t \quad \dots(4.19)$$

Here α_1 and α_2 represent the effects of the stationary linear combination of ECM1 and ECM2 on the system; otherwise they are called as speed of adjustment parameters. This VECM can be used to test Granger causality among the vectors of variables, by testing the statistical significance of adjustment coefficients and coefficients of the lagged explanatory variables.

4.1.2. Methodology of Panel Data:

Panel data combine both the time series and cross section observations, which give more information and efficient result. Econometric analysis of Panel data studies the individual and micro kind of analysis. Panel data can better detect and measure the effect that simply cannot be observed in pure cross section and the time series data. In the present study, the panel data are the balanced panel¹.

4.1.2.1. The Fixed Effects Model:

The fixed effect model is specified as follows:

$$Credit_t = \alpha_1 + \alpha_2 D_{2t} + \alpha_3 D_{3t} + \alpha_4 D_{4t} + \beta_1 + \beta_2 IIP_{it} + \beta_3 WACR_{it} + \beta_4 INTL_{it} + u_{it} \quad \dots\dots\dots(4.20)$$

Where the Credit is the sectoral non-food credit unit, which categorized into four units of individual sectors comes under non-food credit. Those four sectors are Industry, Agriculture, Service and Retail sector. The other variables are explained as follows:

IIP - Index of Industrial Production

WACR- Weighted Average of Call Money Rate

INTL – Yield of the T-364 day

Here, in the fixed effect model, the term is fixed due to the fact that although the intercept may differ across different sectors of non-food credit, but intercept does not vary over time, that is it is time invariant.

4.1.2.2. Random Effects Model:

In the random effects model the intercept is assumed to be a random outcome variable, whereas the random outcome is a function of a mean value plus a random error. Two ways random effects model is used for estimation purpose.

The random effect model pools all the observations, allow each cross section unit to have their own intercept value. We assume that the intercept values are a random drawing from the cross section units. In this respect, we consider the following similar kind of model as specified in the earlier model:

$$Credit_t = \beta_{1i} + \beta_2 IIP_{it} + \beta_3 WACR_{it} + \beta_4 INTL_{it} + \varepsilon_{it} \quad \dots\dots\dots(4.21)$$

Instead of treating β_{1i} is fixed, it assumed as a random variable with a mean value of β_1 and the intercept for an individual company can be expressed as;

¹ A panel is said to be balanced if each subject (firm, individuals, etc.) has the same number of observations. Gujarati(2008)

$$\beta_1 i = \beta_1 + \varepsilon_i \quad i = 1, 2, \dots, N$$

Where ε_i is a random error with a mean value of zero and variance of $\sigma^2 \varepsilon$. Therefore

$$Credit_{it} = \beta_1 + \beta_2 IIP_{it} + \beta_3 WACR_{it} + \beta_4 INTL_{it} + \varepsilon_i + \mu_{it} \quad \dots\dots(4.22)$$

$$Credit_{it} = \beta_1 + \beta_2 IIP_{it} + \beta_3 WACR_{it} + \beta_4 INTL_{it} + w_{it} \quad \dots\dots(4.23)$$

Where $w_{it} = \varepsilon_i + u_{it}$

The composite error Term w_{it} consists of two components: ε_i which is the cross section, or individual specific, error component, and u_{it} , which is the combined time series and cross section error component and is sometimes called the idiosyncratic term because it varies over cross section as well as time. Owing to this intra-panel variation, the random effects model has the distinct advantage of allowing time-invariant variables to be included among the regressors. In the above equation instead of treating the β_1 fixed, we assume that it is a random variable with a mean value of β_1^2 . Here, in the random effect model our four sectors of non-food credit have a common mean value for the intercept.

4.1.2.3. Model Specification Test:

One can think of fixed effects and random effects can be the same model, having different assumptions about $Cov(\beta_i, X_{it})$. There are different tests available for fixed and/ or random effect models. However, we have considered the Hausman test to examine the model and heteroscedasticity here.

4.2. Variable and Data Description:

The present study constructs a four variable time series and panel data regression. The four variables are Non-Food Credit (NFC), the Index of Industrial Production (IIP), Repo Rate and the yield on 364 day T-bill (INTL). However, the variables considered in the panel data include four variables such as Non-Food Credit (NFC), the Index of Industrial Production (IIP), Weighted Average Call Money Rate (WACR) of and the yield on T-364 day T-bill. The study is based on the monthly data analysis. As the monthly GDP data is not available in the context of India, the IIP is considered as the proxy for Indian Monthly GDP. The Repo rate and WACR are considered to represent the short-term interest rates and the yield on the 364-day Treasury bill rate is considered to represent the long-term interest rate. The period of the study is spanning from April 2001 to December 2014. The Index of Industrial Production (IIP) is considered with its latest base period of 2004-05.

² Basic Econometrics. 5th ed. Gujarati(2008)

4.3. Data Analysis and Results:

Before proceeding towards the analysis of the model estimation, the study analyzed the summary statistics of all the variables considered in the estimation. It is worthless to mention here that all the variables are converted to the logarithmic form to take on the scale, size, and different Units issue.

4.3.1. Descriptive Statistics:

To start with, the descriptive statistics are computed and reported in the Table 4.1. This result will help us in the later analysis.

Table 4.1. Descriptive Statistics:

Variables	LNFC	LIIP	LREPO	LINTL
Mean	9.88	4.86	1.94	1.88
Median	10.02	4.95	1.98	1.94
Maximum	11.04	5.26	2.19	2.29
Minimum	8.45	4.34	1.55	1.27
Std. Dev.	0.79	0.27	0.16	0.23
Skewness	-0.22	-0.42	-0.82	-0.48
Kurtosis	1.72	1.71	2.82	2.17
Jarque-Bera	12.47	16.11	18.63	11.11
Probability	0.19	0.31	0.9	0.38
Sum	1620.62	797.13	318.98	308.95
Sum Sq. Dev.	103.76	12.66	4.66	9.2
Observations	164	164	164	164

The results reported here in the Table 4.1 reveals that all the variables have positive mean values suggest the negatively skewed distribution. The kurtosis coefficient, a measure of thickness of the tail of the distribution, which is quite low at the respective level of the concerned variables. A Gaussian (normal) distribution has kurtosis equal to three, and hence, this implies that the assumption of Gauuianity cannot make for the distribution at their levels. This finding is further strengthen by Jarque-Bera test for normality which in our case yields very high values –much greater than for a normal distribution, and, this rejects the null hypothesis of normality of the variable distributions at any conventional confidence level.

4.3.2. Correlation Matrix:

An informal way of looking the relationship between the commercial bank credit, economic output, and both short term and long-term interest rates is through the construction of correlation matrix. The results of the linear association among these variables, presented in the Table 4.2.

Table:4.2 Correlation Coefficient Matrix Among the Variables:

	LNNFC	LNIIIP	LREPO	LINTL
LNFC	1.00			
LNIIIP	0.97* (0.00)	1.00		
LREPO	0.02* (0.00)	-0.01* (0.00)	1.00	
LINTL	0.49* (0.00)	0.46* (0.00)	0.77* (0.00)	1.00

Note: * Significance levels at 1% and Figures in parentheses () are p- value

From this table, it can be seen that there is a negative low correlation (-0.01) between the short-term interest rates (LREPO) and Gross Domestic Product (LNIIIP). This means when there is an increase in the policy rates by the Reserve Bank of India, the loans get costlier and the cost of the borrowing increases and as a result of which the economic activity in terms of Gross Domestic Product declines and vice versa. Similarly, we found a positive high correlation coefficient (0.97) between non-food credit demands and the Index of Industrial Production (IIP).

4.3.3. Stationarity Test:

Before presenting any time series model, we have conducted the Unit Root test on the variables by employing Augment Dickey Fuller (ADF) Test and Phillips-Perron (PP) Test. Prior to this test; we have also plotted the time series plot of the concerned variables in the Figure 4.1. The figures summarize that there is a strong upward trend involved with the non-food credit demand and Index of Industrial production, which prima facie makes the case for the non-stationary series. However, there is a declining trend in the case of both the short term and long-term interest rates. With this time series plot, the econometric estimation of stationary series, further examined through ADF and PP test and reported in the Table 4.3 and 4.4 respectively.

Figure IV.1: Time Series Plot of the Data at Level:

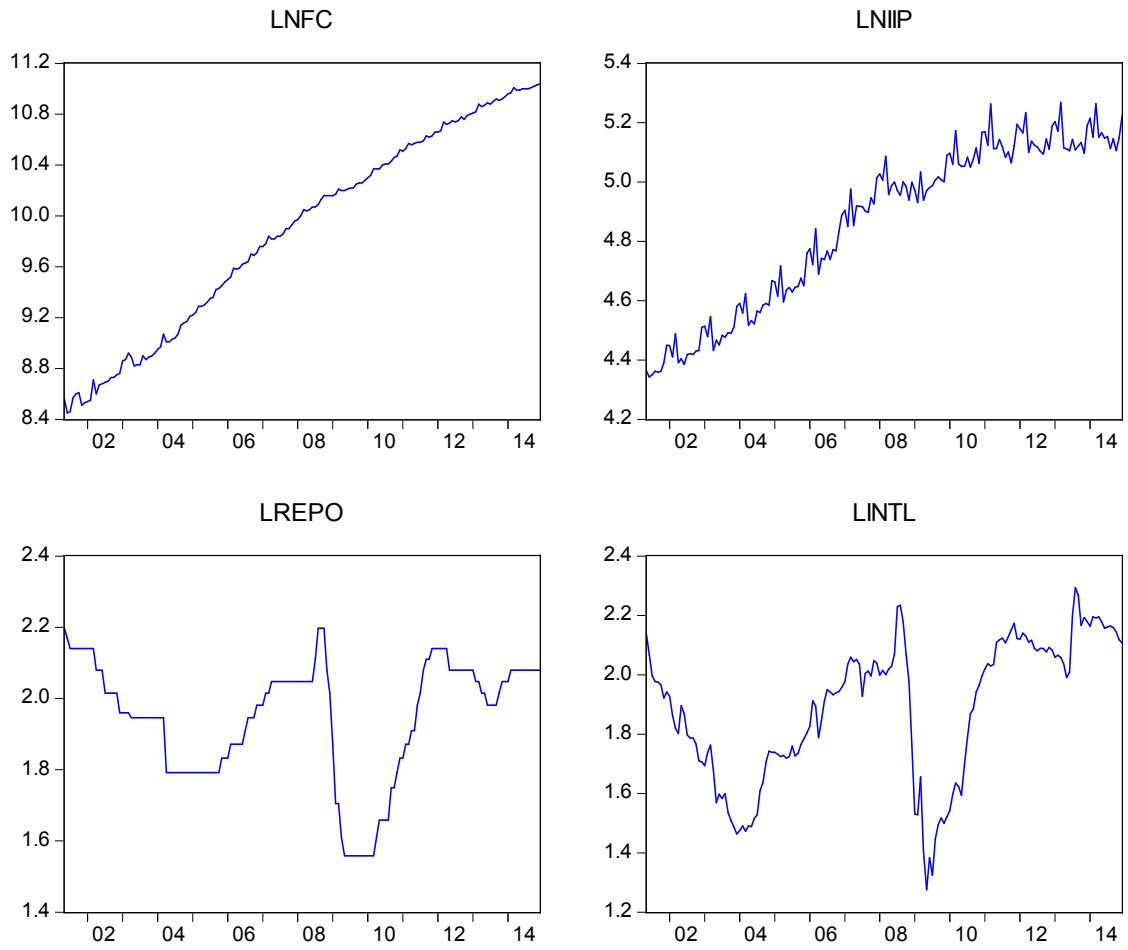


Figure IV.2: Augmented Dickey Fuller Test graph:

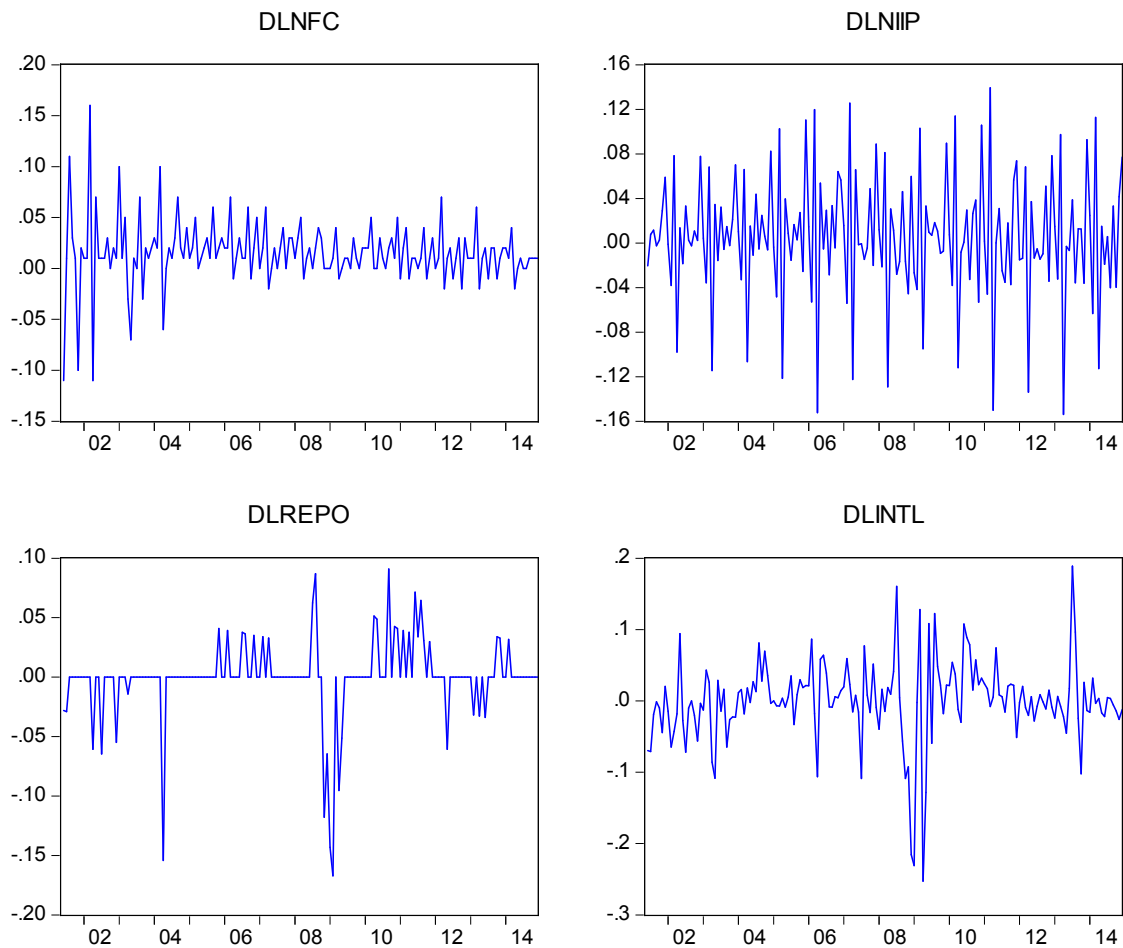


Table. 4.3. Augmented Dickey- Fuller Unit Root Test:

Variables	Test-statistics	Critical values at			p- value
		1%,	5% ,	10%	
D (LNFC)	-8.27	-4.01	-3.43	-3.14	0.00
D (LNIIP)	-7.67	-4.01	-3.43	-3.14	0.00
D (LINTL)	-4.68	-4.01	-3.43	-3.14	0.00
D (LREPO)	-21.26	-4.01	-3.43	-3.14	0.00

Note: all the variables are at Lag 4, with trend and intercept

Table. 4.4. Phillips-Perron test of Stationarity:

Variables	Test-statistics	Critical values at			p- value
		1%	5%	10%	
D (LNFC)	-37.48	-4.015	-3.43	-3.14	0.00
D (LNIP)	-25.22	-4.015	-3.43	-3.14	0.00
D (LINTL)	-9.02	-4.015	-3.43	-3.14	0.00
D (LREPO)	-9.83	-4.015	-3.43	-3.14	0.00

Note: all the variables are at lag 4, with trend and intercept

From the Table 4.3 and 4.4, the Augmented Dickey Fuller test and Phillips-Perron test result shows that the value of Test-Statistics are more than the critical value at 10%,5% and 1% level despite the minus sign of the values. All the four variables converted into log form such as LNFC, LNIP, LINTL and LREPO are stationary at their first difference with lags four yields the result that their test statistics is more than the critical value and the Prob. Value is less than the 5%. It suggests for rejecting the null hypothesis that the series is non-stationary and accepting the alternative hypothesis that the series is stationary. Here, the decision based on both time series plot of the variables and stationarity tests results is that all the four variables are found to be non-stationary at their corresponding levels and found to be stationary at their first difference.

4.3.4. Regression Result:

In the beginning of the analysis, it is better to do the four variables multiple regression analysis by considering non-food credit demand as the dependent variable and commercial paper and statutory Liquidity Ratio considered as the exogenous variables to see the causal relationships between the interest rate and credit demand (Report on Currency and Finance, 2006). From the estimated equation from below, we have found that the coefficients of all the explanatory variables preserve expected sign. The estimated Non Food Credit Demand function have very high R^2 and 'F' values indicating that the chosen determinants could explain the variation in the dependent variable quite well. Likewise, a 1% increase in the rate of interest represented by the Commercial Paper will lead to 0.38% decline in the non-food credit demand. Similarly, 1% increase in the Statutory Liquidity Ratio leads to a rate of 0.20% decline in the non-food credit demand. The DW statistics confirms that there is no autocorrelation problem in the estimated residuals. Hence, the high values of R^2 is rejecting the possibility of spurious result in the estimated regression equation.

$$\text{LNFC} = - 4.34 - 0.38 \text{ CP} - 0.20\text{SLR} \quad \dots(4.24)$$

$$(6.11) \quad (2.5) \quad (4.3)$$

$$[0.03] \quad [0.04] \quad [0.01]$$

$$R^2= 0.98, \quad \text{F-Stat} = 98.68, \quad \text{Prob (F-Statistic)} =0.000, \quad \text{DW}=1.98$$

Note: t- statistic () and probability value in [].

In order to get more information regarding the interest rate and the non-food credit demand of commercial banks, it would be more preferable to do regression analysis based on other interest rate variables to see the cause and effect relationship between them. Therefore, in the next regression equation, we have added one more explanatory variable such as Economic output represented by the Index of Industrial production along with two different interest rates represented by Repo rate for short term and the rate of yield on the 364-day Treasury bill for long-term interest rate.

$$\text{LNFC} = -12.36+ 0.23 \text{ IIP} + 0.11\text{REPO} +0.06 \text{INTL} \quad \dots(4.25)$$

$$(6.11) \quad (2.5) \quad (4.3)$$

$$[0.03] \quad [0.04] \quad [0.01]$$

$$R^2= 0.99 \quad \text{F-Stat} = 318.68 \quad \text{Prob. (F-Statistic)} = 0.00 \quad \text{DW}= 2.27$$

Note: t- statistic () and probability value in [].

In the above estimated equation, we found that there is a positive impact of Index of Industrial production (IIP) and the non-food credit demand. However, there is a contradictory relationship between non-food credit and the interest rates represented by the short term and long-term interest rate. Both the short term and term interest rate positively affect the non-food credit demand. The high R^2 value and F statistics are expected signs. This result makes the study stronger to examine the causality and long run equilibrium relationship between the non-food credit demand and the interest rates. Those time series estimations included in the following section of the study.

4.3.5. Causality Test:

In the next step to avoid the limitation of assuming non-food credit demand is the dependent variable and in order to examine the causal relationship between the set of variables, we have

employed the Toda and Yamamoto (1995) procedure to test the Granger's causality test in the Vector Auto Regression Block Exogeneity Form. As a pre step to the Granger's causality test and the cointegration test we have estimated the optimum lag length by considering the six lag augmentation criterions such as Sequential Modified LR test statistic (LR), Final Prediction Error (FPE), Akaike Information Criterion(AIC), Schwarz Information Criterion (SC), Hannan Quin Information Criterion (HQ). The results of the optimum lag choose by this criterion reported in the Table 4.5.

Table 4.5: Lag Length Criterion for Granger's Causality Test:

Lag	LogL	LR	FPE	AIC	SC	HQ
0	230.59	NA	6.43e-07	-2.90	-2.82	-2.87
1	1182.53	1842.86	3.96e-12	-14.90	-14.51	-14.74
2	1228.76	87.11	2.69e-12	-15.29	-14.58*	-15.00*
3	1246.86	33.19	2.62e-12	-15.31	-14.30	-14.90
4	1267.01	35.90	2.49e-12	-15.37	-14.04	-14.83
5	1292.57	44.23*	2.21e-12*	-15.49*	-13.85	-14.82
6	1305.05	20.95	2.32e-12	-15.44	-13.49	-14.65
7	1318.18	21.38	2.42e-12	-15.41	-13.14	-14.49
8	1328.81	16.76	2.62e-12	-15.34	-12.76	-14.29

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

From this above table, it can be seen that majority of lag length criterion unanimously reported five months as the optimum lag length. Therefore by examining the five months lag length, we examine the causal and long run equilibrium relationship between the variables in further section.

4.3.5.1. Granger Causality Test:

The Toda and Yamamoto (1995) procedure to test for Granger causality in the vector Auto Regression (VAR) block exogeneity form is reported in the Table 4.5.

Table.4.6: VAR Block Exogeneity Test (causality Analysis):

Dependent Variable	Excluded	Chi-sq	df	Prob.
LNFC	LNIP	32.20	5	0.00
	LREPO	1.29	5	0.93
	LINTL	7.42	5	0.19
	ALL	47.94	15	0.00
LNIP	LNFC	24.07	5	0.00
	LREPO	4.18	5	0.52
	LINTL	2.96	5	0.70
	ALL	32.14	15	0.00
LREPO	LNFC	17.56	5	0.00
	LNIP	0.71	5	0.98
	LINTL	56.09	5	0.00
	ALL	70.52	15	0.00
LINTL	LNFC	1.76	5	0.88
	LNIP	4.14	5	0.52
	LREPO	12.33	5	0.03
	ALL	25.13	15	0.04

From this table, the chi square result revealed that there exist a bidirectional causal relationship between the economic output and non-food credit demand. There exists a unidirectional causality from non-food credit demand to interest rates. The result also found the bidirectional causality between both the short term and the long-term interest rates.

4.3.6. Co-integration Result:

The causality test motivates to examine the long run equilibrium relationship among the variables. In order to ascertain possible cointegration relationship among the variables, we have employed Johansen's maximum likelihood procedure and the result of this reported in the table 4.7.

Table.4.7. Cointegrating Test:

Null Hypothesis	Alternative Hypothesis		Critical Values	
			5%	1%
λ Trace Test	λ Trace Test	λ Trace Value	5%	1%
$r = 0$	$r > 0$	73.88	63.87	71.47
$r \leq 1$	$r > 1$	36.14	42.91	49.36
$r \leq 2$	$r > 2$	16.90	25.87	31.15
$r \leq 3$	$r > 3$	5.89	12.51	16.55
λ Max Test	λ Max Test	λ MaxValues		
$r = 0$	$r = 1$	37.73	32.11	37.48
$r = 1$	$r = 1$	19.24	25.82	30.83
$r = 2$	$r = 2$	11.01	19.38	23.97
$r = 3$	$r = 3$	5.89	12.51	16.55

Table 4.7. Summarizes the cointegration result of the concerned the variables. The test of trace statistics shows that the null hypothesis of variables is not co-integrated ($r = 0$) against the alternative hypothesis of one or more co integrating vectors ($r > 0$). Since 73.88 exceed the 5% and 1% critical value of λ_{trace} statistic (in the first panel of table), it is possible to reject the null hypothesis of no cointegrating vectors and accept the alternative of one or more cointegrating vectors. Next, we can use the λ trace (1) statistic to test the null of $r > 1$ against the alternative of two cointegrating vectors. Since the λ trace (1) statistic of 36.14 is lower than the 5% and 1% critical value, we conclude that there is only one cointegrating vector. If we use the λ max statistic, the null hypothesis of no cointegrating vectors ($r = 0$) against the specific alternative $r = 1$ is already rejected. The calculated value λ max (0, 1) = 37.73 exceed the 5% and 1% critical values. Hence, the null hypothesis is rejected. Thus, it is the conclusion that there is only one cointegrating vector.

4.3.7. Short run and long run causality test (ECM Estimates):

The VECM estimates suggest that both the short run and long run behavior of the variables. All the result of the VECM model reported below in the Table no.4.8. From the previous cointegration analysis, it has been seen that there is only one cointegrating vector exist among the variables. Based on that, we estimate the Error Correction Model. Here, the LNFC is the only one variable, which is the dependent variable.

Table 4.8. Error correction model for monthly bank credit demand:

Cointegrating Eq.	LNFC(-1)	LNIIIP(-1)	LREPO(-1)	LINTL(-1)
CointEq1 (Vector of cointegration in L R)	1.00	1.046 (0.09) [-11.60]	0.40 (0.085) [4.79]	-0.37 (0.071) [-5.21]
Error Correction	D(LNFC)	D(LNIIIP)	D(LREPO)	D(LINTL)
Coint. Eq. (the speed of adjustment)	-0.19 (0.05) [-3.61]	0.17 (0.08) [1.95]	-0.18 (0.04) [-3.64]	-0.10 (0.10) [-0.98]
C	0.02 (0.00) [7.75]	0.01 (0.00) [4.03]	0.00 (0.00) [1.71]	0.00 (0.00) [0.44]

Note: Standard error in () and t statistic in [].

The estimation of long-term relationship of demand for credit is shown in the following equations.

$$Ln(NFC)_t = \{C + \alpha\beta Ln(IIPt) + \alpha\beta Ln(REPOt) + \alpha\beta Ln(INTLt)\} + u_t \quad \dots(4.26)$$

$$Ln(NFC)_t = \{C + 1.04(0.17)Ln(IIPt) + 0.40(-0.18)Ln(REPOt) - 0.37(-0.10)Ln(INTLt)\} + u_t \quad \dots(4.27)$$

As per the econometrics literature, when the variables³ are in logarithms and proceed for one cointegrating equation, then the coefficients is the long-run elasticity. The long-term cointegration vector suggests that LNIIIP and LNINTL have a negative impact on the demand for bank credit in the long- run. However, LREPO has a positive impact on the credit.

Results of VECM estimates suggest that the co-efficient value is negative and the corresponding p-value⁴ is less than 5 percent. It means there is the long run causality exists between the commercial bank credit and the interest rates and IIP. The VECM estimation result can only show the short run and log run equilibrium result of the model by considering the entire variable as endogenous.

³ The Forces Behind Currency Exchange Rates, retrieved January 7, 2011 from <http://www.currencynews.ws/?p=75> 2009

⁴ Appendix no.1

4.3.8. Panel Data Analysis of sectoral Non-food Credit and Interest Rates:

We use the panel data model to examine the relationship between the sectoral distributions of credit and interest rates. Panel data technique (Baltagi 2003, Wooldridge 2002) can better detect and measures the effects in a multivariable system in comparison to pure cross section and time series data. Panel data also enable us to study the more complicated behavioral models. Since panel data relate to individuals, firms, states, countries, etc., over time, there is bound to be heterogeneity in these units. The techniques of panel data estimation can take such heterogeneity explicitly into account by allowing for subject specific variables. By taking the sectorial concentrations of credit demand of commercial banks and their relationship with the interest rates, we have considered the monthly data from April 2007 to 2014. The main two interest rate variables considered here are the weighted Average Call Money Rate (WACR) and the yield on the 364-day Treasury bill rate as the proxy of both the short run and long run interest rates.

4.3.9. Results of panel data analysis:

Table 4.9. Results of Panel Unit Root:

Series	t- statistics	Prob.
Log NFC	-5.07	0.00
Log IIP	-10.95	0.00
Log WACR	-24.87	0.00
Log INTL	-9.64	0.00

Table 4.10. Results of panel Data Relating to sectorial distribution of non-food credit

Random Effect Model			
	Co-Efficient	t-statistics	Prob.
LNFC	-6.10	-9.36	0.00
LIIP	2.90	23.64	0.00
LWACR	-0.08	2.11	0.03
LINTL	-0.08	1.27	0.02
R ²	0.69		
ADJ R ²	0.69		

Table 4.11. Results of Fixed Effect Model:

Fixed Effect Model			
	Co-efficient	t-statistics	Prob.
LNFC	-6.10	-10.19	0.00
LIIP	2.90	23.64	0.00
LWACR	-0.08	2.11	0.03
LINTL	-0.08	1.27	0.02
R ²	0.88		
ADJ R ²	0.88		

Table 4.12. Results of Hausman Test:

Test Summary	Chi-Sq. statistics	Prob.
Cross-section random	0.00	0.90

Table. 4.13. Cross-section Random Effects test comparisons:

Variable	Fixed	Prob.
LIIP	2.90	0.99
LWACR	-0.083	0.60
LINTL	-0.084	0.80

The Table from 4.9 to 4.11 represents the results of the panel data estimation and the corresponding heterogeneity test through Hausman test reported in the Table 4.12 and Table 4.13. Both the fixed effect and random effect model results of both the models shows to be statistically significant. The coefficient of IIP in both the models is positive in the sense that economic output positively relate to the non-food credit of different sectors. While the two interest rate variables are having, negative sign indicate the negative relationship between the non-food credit and the interest rates.

4.4. Conclusion:

The empirical analysis categorized into two sections of both the time series and panel data series. The basic purpose of separating the time series and panel data is to see the both macro and microanalysis kind of the relationship between the non-food credit demand of the commercial banks and the different interest rates. There is a negative low correlation (-0.01) between the short-term interest rates (LREPO) and Gross Domestic Product (LNIIP). The regression result confirmed that there exists a negative relationship between the interest rates and non-food credit demand; however, there is a positive relationship between the economic output and non-food credit demand. The cointegration result suggests that there is a long run equilibrium relationship between the non-food credit demand and interest rates. The causality test confirms that there is bidirectional causality between economic output and non-food credit demand and there is a unidirectional causality running from non-food credit demand to interest rates. This result also confirmed from the panel data analysis through fixed effect and random effect while analyzing the relationship between the sectoral distribution of commercial bank credit and interest rates.

CHAPTER-V

SUMMARY OF MAJOR FINDINGS AND SCOPE FOR FURTHER RESEARCH

Commercial Bank credit plays a catalytic role to promote high growth rate in India. Bank credit registered a phenomenal growth of around 38.2 percent during the financial year 2006 backed by a decline in the real rate of interest, moderation in inflation and inflationary expectations, and improvement in the asset quality of credit institutions. However, the bank credit witnessed a significant surge by the mid of financial year 2009, as the alternative funding options for the corporate began to dry up on account of intensification of financial crisis leading to a credit crunch in latter part of second quarter, financial year 2009. As per Reserve Bank of India's weekly statistical supplement, credit growth of Scheduled Commercial Banks on a year to year basis as on March 20, 2015 stood at around 9.2 percent which was lower than 14.5 percent during the same time a year ago. The demands for gross bank credits are emanating from two sources such as food and non food sources. Food credit demand is a very small portion of the gross credit demand, whereas the major demand comes from non food credit. The primary sources of non food credit demand are four sectors such as agriculture and allied activities, Industry (micro, small, medium and large), services, and personal loans. The sectorial concentrations such as agriculture and allied activities reported a credit growth on year to year basis as on March 2015 at around 15 percent against 13.5 percent in the previous year; industries reported 5.6 percent of growth against 13.1 percent during the same time in the previous year; service sector reported at around 5.6 percent against 16.1 percent in the previous year; and personal loans are reported the credit growth around 15.4 percent against the 15.5 percent during the same time in the previous year. This has been summarized in the fact that there has been a clear decline in the credit growth rates in industries and services.

The growth in non food credit demand is basically driven by the changes in the policy rates by the central bank, muted investment, raising risk aversion owing to deteriorating asset quality of public sector banks and an increase in cheaper funds raised by commercial papers. However, the dominant driver of non food credit demand is interest rates changes. Therefore, the relationship between the interest rates and the credit demand is the matter of debate in India while targeting the high growth rates. In this context, we have empirically examined the impact of interest rates on the non food credit demand in Indian commercial banks. Secondly, we have also accessed the responsiveness of the interest rate to the different sectorial concentrations of the non food credit demand in India.

In the second chapter, we have reviewed all the theoretical underpinnings behind the relationship between the interest rates and credit demand. To start with Schumpeter (1911) was perhaps the first economist to examine how well developed banking system helps to contribute significant increase in economic growth. Then Mishkin (1978) and Bernanke (1983) supports the financial aspects of macroeconomics ideas in the context of the Great Depression in their studies. An ample of literature also emphasized that the monetary transmission mechanism channels such as interest rate channel, exchange rate channel, other asset price channel, Bank lending channel and the credit channel while establishing the relationship between the interest rates and the banks credits. The thorough review of empirical literatures in this regard vindicates the fact that the relationship of interest rates to non food bank credit is still inconclusive and mixed. While analysing this relationships, a few literature explained mainly the response of the changes in the policy rates to the bank credit. But there are many interest rates variables in which banks are considering while setting up their corresponding base rate, which is directly linked to the credit disbursements. The introduction of Benchmark Prime Lending Rate (BPLR) in recent periods has not been strictly followed by the banks. In spite of that, they mainly arrive at some sub BPLR interest rates. This sub BPLR rate also varies from bank to bank as this rate is computed at the corresponding bank level. As a result of which the credit facility is affected and sometime the actual benefit is not passed to the investors of the priority sectors of the economy. A few literatures also conspicuously not focused on the short term and long term interest rates while analyzing the relationship between bank credit and interest rates. A large chunk of the literature is only concentrated on the relationship between the gross bank credits and its relationship with interest rates and ignoring the response of the interest rates with the sectorial concentrations of non food bank credits.

The above issue from the review of literature is taken up in the third chapter and the fourth chapter subsequently. In the third chapter we have focussed on the trend analysis by considering the relationship between the non food bank credit demand and the interest rates. The trend analysis has been done in two phases in the sense that the first part is focussing on the

overall credit demand of the economy of the commercial banks and the second portion explained the sectorial distributions of the credit relating to the different sectors and different interest rates. This analysis explained the changes have taken place in the recent period starting from the post reform periods of the Indian economy. The aggregate credit demand has changed mainly after 2001 and in the initial reform periods. On the other hand, the sectorial changes in the credit demand of the commercial banks saw a series of changes in services and the retail

sectors. The banks are mainly adopting some alternative measures to avoid the interest rate changes in order to maintain the credit flow. Economic growth in the post 2000 period was also the main reason when the credit growth picked up to the highest level.

In the fourth chapter, we have empirically examined the impact of interest rates on the non food credit demand and the responsiveness of the interest rates on the sectorial concentration of the non credit demand. To begin with, the chapter makes a four variable time series and panel data regression models. The four variables considered for the analysis are Non-Food Credit (NFC), the Index of Industrial Production (IIP), Repo Rate and the yield on 364 day T-bill (INTL). Nevertheless, the variables considered in the panel data include four variables such as Non-Food Credit (NFC), the Index of Industrial Production (IIP), Weighted Average Call Money Rate (WACR) of and the yield on T-364 day T-bill. The survey is grounded on the monthly data analysis. As the monthly GDP data is not available in the context of India, the IIP is considered as the proxy for Indian Monthly GDP. The Repo rate and WACR are considered to represent the short term interest rates and the yield on the 364- Treasury Bill rates are considered to represent the long term interest rate. The period of the study is spanning from April 2001 to December 2014. The Index of Industrial Production (IIP) is considered with its latest base period of 2004-05. The empirical methodology such as descriptive statistics, correlation matrix, time series regression analysis, Toda and Yamamoto Granger's causality test and Johansen's Maximum Likelihood test for cointegration and Vector Error Correction models are used to evaluate the empirical relationship between the non food credit demand and the interest rates along the time series data. Nevertheless, the sensitivity of interest rates towards the sectoral concentrations of the non food bank credit is analyzed through Panel econometric techniques such as Fixed Effect model and Random Effect model by using the panel data. The major empirical findings of the study are as follows. There is a negative low correlationship (-0.01) between the short term interest rates (LREPO) and Gross Domestic Product (LNIIP). The regression result confirmed that there exists a negative relationship between the interest rates and non food credit demand; however, there is a positive relationship between the economic output and non food credit demand. The cointegration result suggests that there is a long run equilibrium relationship between the non food credit demand and interest rates. The causality test confirms that there is bidirectional causality between economic output and non food credit demand and there is a unidirectional causality running from non food credit demand to interest rates. This result also confirmed from the panel data analysis through fixed effect and

random effect while analyzing the relationship between the sectoral distribution of commercial bank credit and interest rates

5.1 Limitations of the Study:

This study is based on the secondary data sets and followed some traditional approach of theoretical underpinnings behind the relationship between the bank credit demand and interest rates. However, in the recent period there are many changes have been taken place and it led to the introductions of newly innovated financial instruments which helps the banking system to avoid the monetary policy restrictions which do not comes under the earlier theoretical specifications. The existence of several interest rates proxies are the main problem of selecting an appropriate one and claim it as more relevant for the study. Even though the time period for this study is spanning from 2001 to 2014, the study is not considered the effect of global financial crisis of 2007 while analysing the relationship between non food bank credit and the interest rate changes. Ignoring the post reform periods and the crisis of 2007 and its impact have not been seen in separate.

5.2 Scope for Further Research:

Keeping in mind the complexity and magnitude of work in respect of the debating relationship between the non food credit demand and policy rate changes, what is attempted here can at best be considered as only an initiative and tentative exercise. This study is only confined the relationship between non food credit and interest rate changes. However, the growth in non food credit demand is basically driven by the changes in the policy rates by the central bank, muted investment, raising risk aversion owing to deteriorating asset quality of public sector banks and an increase in cheaper funds raised by commercial papers. Therefore, one can study all these factors while analysing the behaviour of non food credit demand in India. In the context of India, there is an existence of multiple interest rates. To represent few interest rates are Repo rate, Reverse Repo rate, CRR, SLR, Bank rate, T-bills such as 91days, 182 days, 364 days, yield on government securities, spot rates and future rates of long tern government bonds, MIBOR, MIFOR, MIBID, deposit rates, Prime Lending rates etc. Hence one can find out first the driver and driven interest rates in the context of Indian economy before proceeding towards to explore the responsiveness of non food credit demand to interest rate changes.

BIBLIOGRAPHY

- Aleem, A. (2010). Transmission mechanism of monetary policy in India. *Journal of Asian Economics* , 21, 186–197.
- Ali, A., & Le, H. (2006). Economic reforms and bank efficiency in developing countries: the case of the Indian banking industry. *Applied Financial Economics* , 16, 653–663.
- Anil, K. K., & Stein, J. C. (2000). What Do a Million Observations on Banks Say about the Transmission of Monetary Policy? *The American Economic Review* , 90 (3), 407-4.
- Ashcraft, A. B. (2006). New Evidence on the Lending Channel. *Journal of Money, Credit and Banking* , 38 (3), 751-775.
- Ataullah, A., & Le, H. (2006). Economic reforms and bank efficiency in developing countries:the case of the Indian banking industry. *Applied Financial Economics* , 16:9, 653-663.
- Bernanke, B. S., & Blinder, A. S. (May, 1988). Credit, Money, and Aggregate Demand. *The American Economic Review* , Vol. 78 (No. 2), 435-439.
- Bernanke, B. S., & Gertler, M. (Autumn, 1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *The Journal of Economic Perspectives* , Vol. 9 (No. 4), 27-48.
- Bhaumik, S. K., Dang, V., & Kutan, A. M. (2011). Implications of bank ownership for the credit channel of monetary policy transmission: Evidence from India. *Journal of Banking & Finance* , 35, 2418–2428.
- Bhole, L. M. (1985). Administered Interest Rates in India . *Economic and Political Weekly* , 20 (25/26), 1089-1104.
- Bikker a, J. A., & Haaf, K. (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of Banking & Finance* , 26, 2191–2214.
- Calza, A., Gartner, C., & Sousa, J. (2001). Modelling The Demand For Loans To The Private Sector In The Euro Area. *ECB Working papers* (No. 55).

- Chong a, B. S., Liu, M.-H., & Shrest, K. (2006). Monetary transmission via the administered interest rates channel. *Journal of Banking & Finance* , 30, 1467–1484.
- Chrystal, A., & Mizen, P. (2002). Modelling credit in the transmission mechanism of the United Kingdom,. *Journal of Banking & Finance* , 26, 2131–2154.
- Dale *, S., & Haldane, A. G. (1995). Interest rates and the channels of monetary transmission: Some sectoral estimates. *European Economic Review* , 39, 1611-1626.
- De.Kock, M. ((1974)). *Central Banking*. London : Closby Lodewood Staples.
- DÕAuria, , C., Foglia, , A., & R, P. M. ((1997)). Bank interest rates and credit relationships in. *Journal of Banking & Finance* , 23 , 1067-1093.
- Dua, P., Raje, N., & Sahoo, S. (2003). Interest rate Modelling and Forecasting in India. *Department of Economic Analysis and Policy Reserve Bank of India* (20).
- Dua, P., & Pandit, B. (2002,). Interest rate determination in India: domestic and external factors. *Journal of Policy Modeling* , Volume 24, (Issue 9,), 853–875.
- EPW, R. F. (1989). Controlling Credit. *Economic and Political Weekly* , 24 (41), 2275.
- Foundation, E. R. (2007–08). *Agricultural Credit In India Changing Profile And Regional Imbalances*. Mumbai.
- Foundation, E. R. (2011). Is the Growth in Bank Credit a Serious Concern? *Economic & Political Weekly* , XLVI.
- Freixas, X., & Rochet, J.-C. (March 2008). *Microeconomics of Banking* (Second Edition ed.). MIT.
- Fung, M. K., Ho, W., & Zhu, L. (2000). The impact of credit control and interest rate regulation on the transforming Chinese economy: an analysis of long run effects. , *Journal Of Comparative Economics* , 28, 193-320.
- Gertler, M., & Gilchrist, S. (1994). Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms. *The Quarterly Journal of Economics* , Vol. 109 (2) , 309-340.
- Ghosh, S. (2006). Monetary Policy and Bank Behaviour: Empirical Evidence from India. *Economic and Political Weekly* , 41 (10), 853-856.

- Gowds, M. (1977). Behaviour of interest rates in Post War Indian Money Market. *prajnan* , VI (4), 491.
- Gozgor, G. (2014). Determinants of domestic credit levels in emerging markets: The role of external factors. *Emerging Markets Review* , *Emerging Markets Review* , 1–18.
- Gozgor, G. (2014). Determinants of domestic credit levels in emerging markets: The role of external factors. *Emerging Markets Review* , 18, 1–18.
- Kashyap, A., Stein, J., & Wilcox, D. (1993). “Monetary policy and credit conditions: evidence from the composition of external finance” ,. *The American Economic Review* , 83, 78-93.
- Kashyap, A. K., & Stein, J. C. (1994). *Monetary Policy and Bank*. The University of Chicago Press.
- Kohli, R. (2001). Will Interest Rate Cut Work? *Economic and Political Weekly* , 36 (No. 10), 809-810.
- Koivu, T. ((2009)). Has the Chinese economy become more sensitive to interest rates? Studying credit demand in china” ,. *China Economic Review* , pp. 455-470.
- Lensink *, R., & Sterken, E. (2002). Monetary transmission and bank competition in the EMU. *Journal of Banking & Finance* , 26, 2065–2075.
- Matthews, K., & Thompson, J. (2005). *The Economics of Banking*. The Atrium, Southern Gate, Chichester, LONDON: John Wiley & Sons, LTD.
- Mishkin, F. (1996). “The channels of monetary transmission: Lessons for monetary policy” ,. *NBER Working Paper* (No. 5464).
- MITCHELL, A. P., & RAGHURAM, G. R. (March 1994). The Benefits of Lending Relationships: Evidence from Small Business Data. *Journal of Finance* , 49 (1), 3-37.
- Modigliani, F.; Miller, M. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Review* 48 (3): 261–297.
- Mohan, R. (2006). Agricultural Credit in India: Status, Issues and Future Agenda. *Economic and Political Weekly* , 41 (11).
- Mirdala, R. (2009). Interest Rate Transmission Mechanism of Monetary Policy in the Selected EMU Candidate Countries. *Panoeconomicus* , 3, 359-377.

- Pandit, B. L., & Vashisht, P. (2011). Monetary Policy and Credit Demand in India and Some EMES. *Indian Council For Research On International* (Working 256).
- Pandit, B., Mittal, A., Roy, M., & Ghosh, S. (2006). Transmission Of Monetary Policy And The Bank Lending Channel: Analysis And Evidence for India. *Department of Economic Analysis and Policy Reserve Bank of India Mumbai* (Study No.25).
- Patnaik, A., & Ramanathan, A. (2007). The Interest Rate Channel of Monetary Transmission Mechanism in India: An Empirical Study. *RBI*, XLIX (No.2), 141-156.
- Petersen, M. A., & Rajan, R. G. (1995). The Effect of Credit Market Competition on Lending Relationships. *The Quarterly Journal of Economics*, 110 (2), 407-443.
- Rakesh Mohan(November 2004), *Agricultural Credit in India: Status, Issues and Future Agenda*. Reserve Bank of India Bulletin, Mumbai.
- Ramsey, V. (1993),). How important is the credit channel in the transmission of monetary policy ?, 39 (1993),. *Carnegie-Rochster Conference Series on Public Policy*, (39), 1-45.
- Rangrajan, . C. (2001, June). Some critical issues in Monetary Policy. *Economic and Polital Weekly*, pp. 2139-2146.
- RBI. (2007). *Credit Market*. Mumbai: Report on Currency and Finance.
- RBI. (2007). *Report on Currency and Finance* ., Mumbai: Reserve Bank of India.
- Sahu, G. B., & Rajasekhar, D. (2006). Banking Sector Reform and Credit Flow to Indian Agriculture. *Economic and Political Weekly*, 40 (53), 5550-5559.
- Samantaraya, A. (2008). Monetary Policy of the Central Bank: Simplifying the Mystique,. *CAB Calling*, 32 (No.2), 17-24.
- Sami Nabi, M., & Suliman, M. O. (2011). Credit rationing, interest rates and capital. *Economic Modelling*, 28, 2719–2729.
- Satish, P. (2007). Agricultural Credit in the Post-Reform Era: A Target of Systematic Policy Coarctation. *Economic and Political Weekly*, 42 (26), 2567-2575.
- Schnatter, S. F., & Kaufmann, S. (2006). How Do Changes in Monetary Policy Affect Bank Lending? An Analysis of Austrian Bank Data. *Journal of Applied Econometrics*, 21 (3), 275-305 .

Srivastava, P. (1992). Are Formal and Informal Credit Markets in India Interlinked? *Economic and Political Weekly* , 27 (41), 2241-2245.

Taylor, J. B. (1995). The Monetary Transmission Mechanism: An Empirical Framework. *Journal of Economic Perspectives* , 9 (4), 11-26.

Velayudham, T. K. (1989). Credit Policy: Shift Away from Regulation. *Economic and Political Weekly* , 24 (20), 1083-1086.