
Impact of sectoral bank credit on economic growth in India – an empirical analysis

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Abstract: The aim of the present study is on empirically testing the impact of sectoral credit amongst Indian sectors on economic growth. This was achieved by studying the relation between sectoral credit, liquidity and economic growth. The results of the study prove that the sectoral credit was seem to be working on the growth of Indian markets in the long run. On the contrary, it was found that in the short run not only credit was an important factor which impacted the growth of the economy but increase in broad money liquidity, i.e., M3 also impacted sectoral credit which was in favour of our research hypothesis. Similarly, it was also found that past volatility change in terms of different sectors growth was impacting current economic growth again showing the applicability of the concept of increase in sectoral credit and liquidity impacts the economic growth in the Indian markets. However, the external shocks in the variables affect the stable equilibrium in the short run while these stability in the markets were maintained in the long period of time.

Keywords: sectoral credit; economic growth; vector error correction model; VECM; impulse response; M3; ADF stationarity test; regression.

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1 Introduction

In every economy, money creation is an important part of development. Banks always attempt to measure money creation in the economy with the help of money multipliers but fails to do so due to information asymmetries. These asymmetries exist in the form of misinformation on the part of creditors and credit providers or includes the lack of information on the part of financial markets. Therefore, banks often resort to money creation in the economy by providing credit to the needful and important sectors. For instance, when agriculture sector was having shortage of funds for further expansion and growth, then credit policies were framed to focus on their growth. Whenever talented students with capability to contribute in country's economic expansion in future, then the government helps them by providing financial assistance. Therefore, banks have a separate provision of providing them with financial loans as study loans under the head of priority sector. This has helped in improving the existing human capital of the economy and building up the future stock of capital. Similar is the case for credit in service sector, health sector or personal sector.

Credit in the economy is created through two different sources, i.e., market-based source and bank-based source. Market-based sources enable the needy people or entity to obtain credit from equity market on financial stability terms. This market credit is obtained in the form of funds from stock market, FDI or funds from non-financial market. On the other hand, bank credit given to different sectors is obtained from commercial banks, NBFCs and development banks. Bank credit helps in estimating the actual level of development in different sectors, which in turn signifies its significant impact on economic growth. It not only helps in the development of the sectors in economy, but also supports the innovative and ignited younger minds for future prospects of growth.

In the web of banking system and economic growth, banking channel plays the crucial part of transmission channel to disseminate the macroeconomic shocks (Ciccarelli et al., 2015). Credit provided by the banking channel contributes to the risk accumulation due to its risk taking activities. The riskier credit leads to higher risk potential for the whole system, causing the financial crisis to reach in the worst scenario. Generally, this financial crisis creates short run and long run chaos in the economy. And this chaos can turn into political instability in future. Recently, this situation was prevailing all over the world. In present scenario, recession is widespread in the world and is seen in India also. Main cause of this recession is deficient demand for money from people. To fight this recession, banks often increase money supply in the form of credit to re-create the demand which sometimes pushes back the inflationary pressure on prices. Bordo et al. (2016) found that policy uncertainty has a significant unfavourable effect on economic growth of a country. This effect was heteroskedastic across the banks studied in his paper.

In India, stock market (including debt and equity) and banks have been continuously expanding especially, when the prime minister of India launched financial inclusion policies such as Jan Dhan Yojana in 2015. This was implemented to increase the financial inclusion of people so that the poor' people of the country also enjoy a certain share in the savings and growth of the country. Such campaigns increase the amount of available funds with the commercial bank to lend in the market. With a rise in money level, investment projects and credit sanction occur at a faster pace to boost the growth rate in the country. This relationship between credit and growth always serves like a puzzle. In some countries this relation exhibits positive trend and in some others this

relation is negative. In fact, this relation also varies over a period of time. So researchers often attempt to study this relation and make the fruitful forecasts about the future.

Why they focus on providing low rate credit? Why RBI supports government decision of credit creation? Why central bank and government forms joint policies to make credit available to all sectors in the economy in spite of increasing NPA's? There are many such questions whose answer is one word 'economic growth'. The banking sector plays a significant role in boosting the growth level of the economy by using monetary policy instruments. This had been done in the form of increasing the monetary base of the country by lowering the interest rates on credit. Banks provide credit to various sectors of the economy which in turn has an impact on economy's growth capacity. For instance credit to agriculture sector is provided with a hope of improving the crops yield and for adoption of modern cost-effective technology. This makes the domestic economy competitive in the international market and results in economic growth (represented by GDP in this paper). Same explanation goes for other sectors also like industrial sector, service sector, government's sector fiscal position, personal loan sector and priority sector involving education loans. In the current study, we have additionally taken money supply (M3) as an important variable, a measure of broad money, which is a collective measure of impact of total credit on the economic growth.

According to the IMF analysis, recently India climbed to the fifth place from the ninth place in terms of GDP. This position has been attained after struggling for ten years. Main reason behind the growth is that, in the past few years government has been focusing on increasing financial assistance in the economy. Whether it is the help for farmers or assistance for innovators, government and financial intermediaries are not stepping back.

It is mainly because government always has an incentive in increasing financial assistance for the needy sectors. It not only helps in increasing the rate of growth but also helps fights back t recession. A bank centric banking sector helps in better economic growth through credit creation in the country. If credit from banks is used in various productive activities, then it adds to the country's growth and income. And if this credit is used in unproductive activities then it adds to the debt burden of the banks and government in the country.

This research paper will administer sufficient concrete empirical proof for those believing in contribution of credit sanction in economic growth of various sectors. It will show that expansion of economic activity in various sectors, for instance in industrial sector, helps in increasing the demand for its product. This demand was fulfilled by creating supply requiring capital funds, ultimately leads to increase in bank credit. It in turn affects our economic growth (GDP). Similar is the case in education sector. To increase the literacy rate in the country, government needs to label the sector as priority sector. And prioritising the sector means promoting the banks to provide low interest rate education loans to the families whose children cannot afford their higher studies. Consequently the literacy rate of the country rises.

The contents of this paper are as follows: First part is the introduction, –followed by Section 2 which contains the literature review which will give us a glimpse of the exemplary researches done in this area till now. This section will help us define some research gaps and will conclude with objective formulations for our current research. There will also be a sub section here, which includes the research hypothesis for our dissertation. Section 3 includes research methodology where in an elaboration of type of

research, type of sampling, data collection methods, and proposed analysis tools and techniques has been done.

Section 4 encompasses of the detailed analysis of data with results Section 5 comprehends the results with justifiable conclusion and discussion Section 6 constitutes the Limitations of our research work and scope for further research and the last Section 7 covers the references.

2 Literature review

Under literature review, we are going to focus only on those researches which have studied the spiral of credit and growth in various economies.

Rioja et al. (2014) show that the finance-growth relationship varies with the level of economic development. Specifically with passing time, relation between credit and growth weakens. Many other economist had supported the same statement but none of them explained the reason behind it. This paper is also going to test whether the relation is true or not and if true what is the reason behind it to exist.

Festré and Nasica (2009) in their paper discusses the role of banks as ‘social accountants’ – needed for the budget constrained realisation of individual choices and to make those choices mutually compatible. He highlighted the importance of banks as financial intermediaries in mobilising savings and deposits with different risk, to provide credit for the economic development.

Minsky (1992) postulated that the proper role of the financial system was to promote the ‘capital development’ of the economy. In times of high credit growth quality standards could get compromised, which are seeds to a crisis that follows thereafter. This culminates in a ‘Minsky point’ or a ‘Minsky moment’, which is the starting phase of a financial crisis where the supply of credit dries up, causing a panic in the financial system. He proved that when the supply of credit falls by greater amount in the economy, it indicates the starting point of crisis going to occur in the near future. Because to take up any new plans for the growth, entities require fund and absence of funds create hustle in the economy.

Calza and Sousa (2003) in their paper said that development in bank credit structure contains a significant information about the state of the economy’s sectors particularly in terms of inflationary pressure. He said that if we take a closer look towards credit development in different sectors we get to know about its current and future growth prospect. So we got an empirical proof to use bank credit in determining the sector wise growth of the economy.

Hassan et al. (2011) also attempt to study this relationship using panel and variance decomposition methodology in low and middle income countries classified by geographic regions. He found a positive relationship between financial development and GDP in developing countries. He said that “a well-functioning financial system is a necessary but not sufficient condition to reach steady economic growth in developing countries”.

According to Serven and Solimano (1992), the restrictive credit and monetary policies included in stabilisation process effects investment in two ways: first, it raises the real interest rate which leads to rise in user cost of capital and ultimately creates reduction in capital. Secondly, it also makes retained earning expensive, which have the same impact on level of investment as discussed in the above point.

Kamin and Rogers (2000) had a view that higher inflation and interest rate may depress the demand for bank deposit and causes the bank to reduce its supply of credit thereby leading to fall in spending. It is very well said that high level of inflation makes the economy disabled and results in instability of policies. So to detect the actual impact of credit on growth, government have to keep inflation in control.

Pradhan (2018) studied the interaction between trade openness and economic growth. By using various test like ADF, VAR, vector error correction model (VECM), and granger causality he found that trade openness in stock market and banking system is highly cointegrated with the economic growth in G20 countries.

It shows that many investigations were made to study this relationship in the country. Some in favour while some in against. This paper is also going to study the time series effect for current period by taking the research of previous researchers as a base.

3 Data and research methodology

3.1 Data source and objective

The review of literature has clearly laid down how credit availability, impact the growth rate in the economy. Most researchers have focussed on development of this theory and how it could be applied in practice. Some researchers have proven it with real life examples while others have proven it theoretically. We also witnessed a couple of research papers which have studied this linkage empirically in India. In our paper, we proceed further and study this empirical relationship for the current time period in various sectors.

In the light of the above statement, the following are the research objectives of the study:

- 1 to understand the relation between sector-wise credit and its impact on economic growth
- 2 to incorporate the concept of broad money, i.e., M3 and test whether it has any general impact on economic growth
- 3 to empirically test the relation between credit and growth.

3.2 Description of data and its variables

For the following study, time series monthly data of India taken for the period of 12 years (from May 2007 to May 2019) was taken from the database of Federal Reserve (FED) and Reserve Bank of India (RBI). The variables taken for study are:

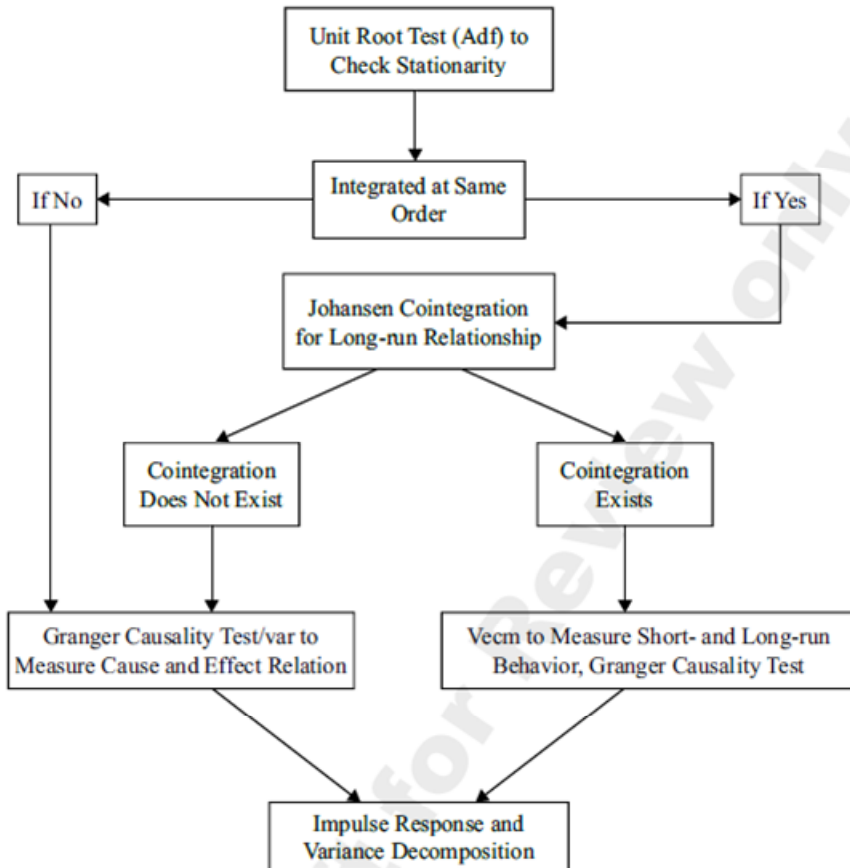
- 1 GDP
- 2 credit in agriculture and allied activity
- 3 outstanding credit of industrial sector
- 4 service sector credit
- 5 personal outstanding loan
- 6 priority sector outstanding credit

- 7 M3 or broad money
- 8 central government debt.

3.3 Methodology

Till now, several approaches have been used to study this relationship by various econometrics tools and methods. Each method has its own merits and demerits based on the different assumptions underlying each method. There can be a two-way relationship between credit and growth which we attempt to test in this paper by using granger causality test in the short run and impulse response function in the long run. cointegration test is also used to study the long run linear stationary combination of individual non stationary variables. Because of many independent variables taken in this study we have applied Johansen cointegration test to study this impact. I have also applied VECM to detect the equations for the same. And regression is used to get a overall glimpse of total credit on economic growth.

Figure 1 Data analysis step



Source: Agarwal (2019)

Under data diagnostic we performed the given tests:

- 1 stationarity test
- 2 sc-integration test
- 3 VAR and VECM model
- 4 impulse response function
- 5 Granger causality test
- 6 graphical representation
- 7 overall model impact testing by using regression.

3.4 Research hypothesis

This paper is going to empirically test the ‘positive relation between creation of credit in various sectors of the economy and economic growth by also considering change in broad money’ with the help of various econometrics tool and methods described above. To test the above model, paper has developed the following hypothesis:

3.4.1 Hypothesis for studying the impact of sectoral credit on GDP

- H₀₁ There is no significant impact of agriculture sector credit on economic growth (GDP) of India.
- H₀₂ There is no significant impact of industrial sector credit on real GDP of India.
- H₀₃ There is no significant impact of service sector credit on real GDP of India.
- H₀₄ There is no significant impact of priority sector credit on real GDP of India.
- H₀₅ There is no significant impact of personal sector credit on real GDP of India.
- H₀₆ There is no significant impact of central government debt on real GDP of India.
- H₀₇ There is no significant impact of M3 on real GDP of India.

3.4.2 Hypothesis for studying the impact of broad money on sectoral credit and GDP

- H₀₈ There is no significant impact of M3 or broad money on sectoral credits of India.

If the test results turned out to be significant indicating that there is a significant relationship among the sectoral credit, M3 and economic growth, then the null rejected for each equation. If the variables are not significant then the null is accepted. In the above hypothesis we have considered the variables as endogenous, we have also impacted them by their lagged values, to study the existing relationship among the variable in the presence of non-stationarity and upward trend.

3.4.3 Hypothesis for capturing the effect of total credit on economic growth

H₀₉ There is no significant impact of exogeneous changes or external shocks in the economy on sectoral credits of India.

3.5 Model proposed for this study

The selected macroeconomic and credit variables relation is depicted as shown in equation (1)

$$GDP = f(\text{Agriculture credit, industry credit, service credit, priority sector credit, personal credit, central debt, M3}) \quad (1)$$

This equation studies the impact of sectoral credit variables and broad money on GDP. The ordinary least square method is not suited to test the stated hypothesis because the data have variability over time and the error term has a nonconstant variance and mean. The basic assumption of OLS being 'BLUE' is violated here. We, therefore, are using the time series analysis in financial econometrics to test our hypothesis, taking one variable at a time and repeating the analysis steps again and again for all the variables.

Similarly, for testing whether the liquidity in the economy affects the credit of various sector, we have developed the following equation:

$$M3 = f(\text{Agriculture credit, industry credit, service credit, priority sector credit, personal credit, central debt, GDP}) \quad (2)$$

This relation is studied because, in the past, M3 had impacted the availability of the credit in the economy. With non-stationarity in mean and variance, M3 also shows the variability in accordance with the sectoral credit of the economy as we are going to show in the graphs. It had the indirect impact on credits which ultimately effects the economic growth of the country. Therefore we have separately developed the model to analyse its impact on banking credit and GDP so that a true relation and impact will be obtained.

Testing the overall impact of credit on economic growth we will apply the regression of total credit on GDP. It will help us to find whether any exogeneous changes are impacting our growth variable or not. For ex, it will help us in judging whether any technological changes have an impact on economic growth. So, our model will be

$$\text{Log GDP} = \beta_0 + B1(\text{Log(total credit)}) + \text{Error term.}$$

4 Results and inferences

Results of the undertaken study are given in appendices. Initial test discusses about the result of the variable being stationary or not. For testing the stationarity, we have adopted two methods already discussed above:

- a Augmented-dickey fuller test which only takes into account the unit root or non-stationarity present in the model.
- b Phillip-Perron test checks the stationarity of the variable by correcting the series for autocorrelation and heteroskedasticity.

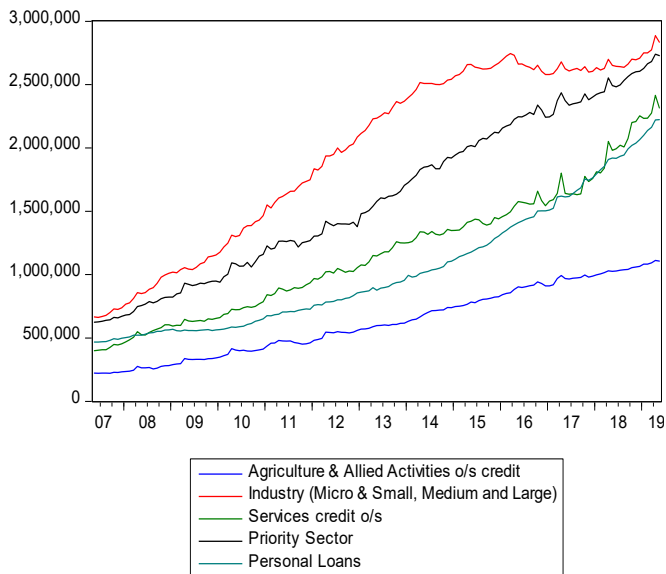
Results show that all of the eight variables taken in our model were non-stationary. By analysing the results, we got to know that test value of different variables at level, indicates non-stationarity in the data. Agriculture credit, industrial credit, central government debt, priority sector credit, M3 and GDP have become stationary in their first lag. Service and personal sector credit are still non-stationary. Therefore, we computed the value of the variables at the second differenced level. The result comes out to be highly significant, making the remaining series stationary. So, the combined order of integration in the model of variables is '2'.

Also, to provide backhand support to the analysis, we have summary statistics mainly including mean, standard deviation and JB normality test. Values of mean and variance showed that the series had greater fluctuations implying the possibility of biasedness in the obtained results of ADF stationarity test. To rule out this possibility, JB normality test was applied to check the distribution of the variables. For supporting the results, we had also plotted its graph against time variable. Variable graph demonstrates that except GDP, all other variables of sectoral credit including M3 were non-stationary with a positive upward trend and intercept whereas GDP series showed non-stationarity with a positive intercept only but not the trend.

4.1 Sectoral credit stationarity

Central government debt also shows the non-stationarity of the data with an upward slope but with greater fluctuations as compared with the plot of sectoral credit.

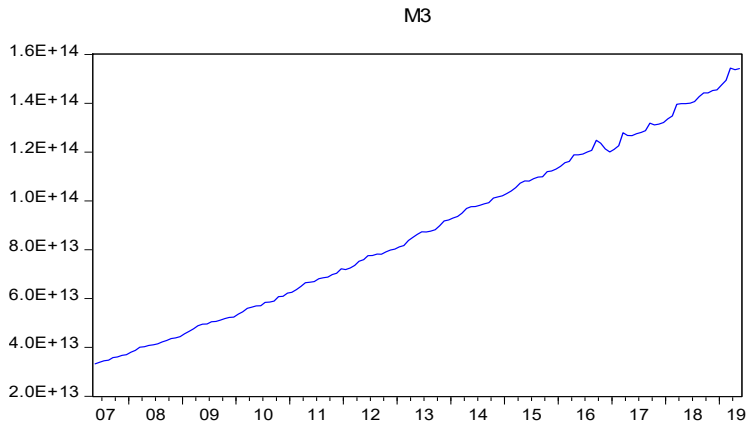
Figure 2 Sectoral credit (see online version for colours)



Note: x-axis showing time and y-axis showing sectoral credit.

Source: Author's analysis

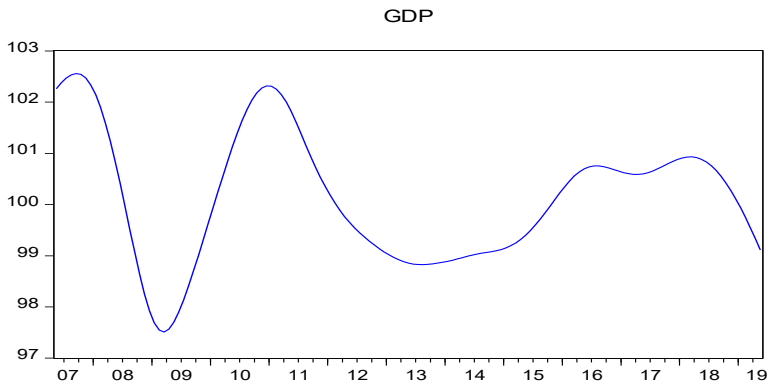
Figure 3 Broad money (M3) (see online version for colours)



Note: x-axis showing time and y-axis showing availability of M3.

Source: Authors analysis

Figure 4 GDP (see online version for colours)



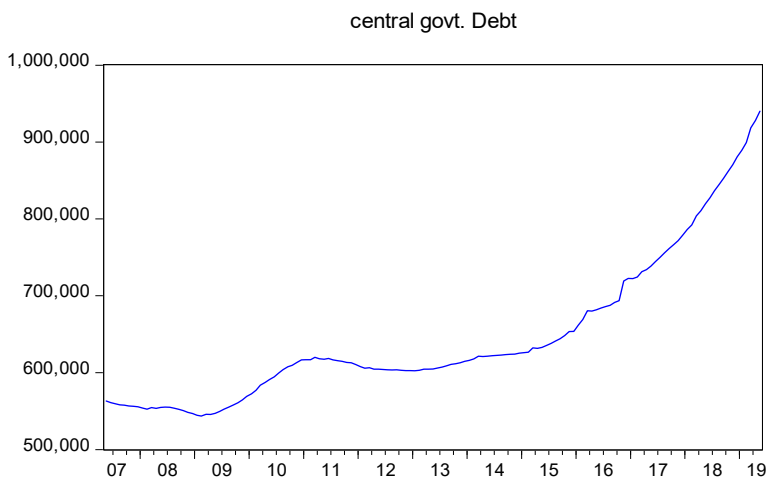
Note: x-axis showing time and y-axis showing GDP.

Source: Author’s analysis

Table 1 Regression results

Dependent variable <i>Log GDP</i>	<i>Allowing for constant</i>		<i>Model with no constant</i>	
	<i>Coefficient (standard error)</i>	<i>P-value</i>	<i>Coefficient (standard error)</i>	<i>P-value</i>
<i>Log credit</i>	-.0040538 (0.0023027)	0.080*	0.2953433 (0.0007166)	0.000***

Notes: *Signifies 10% level of significance, ** signifies 5% significance level, *** signifies 1% significance level.

Figure 5 Central debt (see online version for colours)

Note: X-axis showing time and y-axis showing central debt.

Source: Author's analysis

Graph shows that there are higher chances of a positive relationship among the variables as each of them was upward sloping with a positive trend and depicts a somewhat similar pattern. So there might be the possibility of cointegration among the variables. But these graphs don't provide a clear indication on the exact relation between sectoral credit, M3 and GDP.

For taking into consideration this possibility, cointegration test was applied. Because there were more than two variables in the model, the Johansen cointegration test is applied. It was applied to check whether any linear combination of variables is present to form a model, so that they together make the resulting outcome stationary. Table 1 shows the result in this respect. We have two parameters (or eigen value), i.e., λ_{\max} and λ_{trace} to detect the order of cointegration. Both eigen values in the table depict the order of cointegration to be 5 in the presence of trend. For the decision of rejecting null hypothesis, 0.05 level of significance is considered. Rejection means that there don't exist the cointegration among the variable. λ_{trace} showed the rejection of null till order 4 and at order 5 we accept the null of having cointegration in atleast among the five variables. So, It clearly means that at least there are 5 variables to form the linear combination among themselves so that stationary outcomes will be obtained and the minimum order of cointegration is 5. Same results were shown by λ_{\max} too, except the fact that it takes into account the alternative hypothesis of having exactly 5 co-integrated variables. So the exact order of cointegration is 5, supported by both of the parameters.

Till here, we had seen that in the long run, there exist the stochastic trend among each variable as demonstrated in the graphs. So because of the presence of co-integration and trend among the variables, we have calculated the vector autoregressive error correction model to detect the speed of error correction adjustments in the long run, endogenously in the model. The assumption is that, all of our main variables were determined endogenously and any external shocks does not permanently disturb the long run stable equilibrium. We are studying the intertwined impact of variables with the help of the significant coefficients in the equations. In the following VECM model equations, we

have 8 different variables, taken step by step as dependent variable, to study the speed of adjustment in the errors over a long period of time. These equations show adjustment speed to both short run fluctuations and long run fluctuations in cointegrating equations. Before moving further towards its explanation, remember D means differenced value of the given variable and (-1) and (-2) simultaneously represents first and second lagged value. Now let's analyse its result in main VECM equations:

$$\begin{aligned}
 D(G1) = & -0.001750 (G2) + 0.000353388129596 * P1 + 0.000160563475749 * T1 \\
 & -0.000179744019267 * S1 - 2.37468342009 * @TREND(07M05) \\
 & -341.868539566) + -2.18E-08 * (M1) - 23.4026124899 * P1 \\
 & -13.9496366327 * T1 + 13.1566323544 * S1 \\
 & + 165966.752363 * @TREND(07M05) + 17282381.8494) + -1.21E-15 (B2) \\
 & -146901767.296 * P1 - 86875805.2533 * T1 + 67302942.6163 * S1 \\
 & + 587061280045 * @TREND(07M05) + 8.30652129496e+13) \\
 & + 1.889643 D(G2) + -0.923454 D(G3)) + -4.76E-08 D(T1) + -0.002164
 \end{aligned} \tag{3}$$

Here, the model explains about the cointegration relation exist between GDP and its lag with various other variables explained within the model. These variable are GDP, M3, personal loan, priority sector loan, Service sector credit and Industrial credit along with their first or second lag. This model is highly significant with f-value of 14705.63 and it explains about 99.9% of fluctuations in the model. However, it have a significant level of negative autocorrelation with DW value of 0.28 in the model. Its standard deviation is also low so we can say that model with GDP as its dependent variable explains the most of the fluctuations in the economy. In other terms any changes in the sectoral outstanding credit (including agriculture, industry, personal, priority, and service sector) explains most of the changes in Economic Growth indicated by GDP.

$$\begin{aligned}
 D(B1) = & -12589299 * (A1 - 0.527671906073 * P1 - 0.179916010698T1 \\
 & + 0.316226380594 * S1 - 3353.64520174 * @TREND(07M05) \\
 & + 87310.8302154) + 6001569(M1) - 23.4026124899 * P1 \\
 & -13.9496366327 * T1 + 13.1566323544 * S1 \\
 & + 165966.752363 * @TREND(07M05) + 17282381.84494) \\
 & + -0.981433 * B2 - 146901767.296 * P1 - 86875805.2533 * T1 \\
 & + 67302942.6163 * S1 + 587061280045 * @TREND(07M05) \\
 & + 8.30652129496e+13) + -49896124 D(C2) + 0.496819D(B2) \\
 & + 0.505127 D(B3) + -20605081D(P1) + -10757274 D(S1) \\
 & + -6177041D(S2) + 9.18E+11
 \end{aligned} \tag{4}$$

It shows the relation between value of differenced M3 with its own lagged values and other lagged variables of M3, personal loan, central government debt and service credit. It also showed that fluctuations in the model are jointly determined by the cointegrated variable at a significant value of 4.66 and R² value showed that the 44.9% of fluctuations in variable are determined within the model with no autocorrelation (DW value is 2.07).

Initially, we had seen 8 different equations of cointegrated VECM model. But in the results we had only shown 2 VECM equations which are important and relates to our objective of studying the impact of credit on GDP and M3. By testing its F-value, each of

the model developed above was jointly significant and definitely attains a long run equilibrium. It was inferred from the above results that each of the section of sectoral credit are spirally linked and impacted by each other, after the adjustments of the shocks in the calculated error correction model. The coefficients of each significant variable holds a great impact on GDP. The model with GDP as a dependent variable, explains the 99% of the fluctuations in the variable with a highly significant coefficient in the presence of trend. It provides the validity to our objective of having significant effect of sectoral credit on GDP in the long run. In results, GDP is found to be cointegrated with its own lag, priority sector, personal sector, industry sector, service sector and M3. For all these variables, we reject the null of having no impact on GDP in the long run. So it was clearly seen that impact of sectoral credit holds a significant impact on economic growth in the long run.

Apart from this we have also included the measure of broad money called M3 in our study to find its indirect effect on GDP via sectoral credit. This variable is seen to be interlinked with rest of variables taken in our study. Cointegrated variables in the VECM model are lagged values of agriculture credit, personal sector, priority sector, service sector, M3 and central debt. Their coefficients are also significant. So we can say that M3 do applies an important impact on sectoral credit. It was seen that the speed of error correction adjustment among the variable were deviating the outcomes towards the long run stable equilibrium. In comparing different VECM model, it was found that model with GDP as a dependent variable is the best fit model in terms of AIC and SIC criteria with a highly significant F-value to explain the fluctuations of the model. Second best model is the equation with central government debt as the main variable as it also have significant test values. However in the long run there was no significant impact of M3 on GDP.

Table 2 Regression of error on log GDP

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	Number of obs = 145		
Model	.00047343	1	.00047343	F(1, 143) = 3.10		
Residual	.021843732	143	.000152753	Prob > F = 0.0805		
Total	.022317162	144	.00015498	R-squared = 0.0212		
				Adj R-squared = 0.0144		
				Root MSE = .01236		
<i>LogGDP</i>	<i>Coef.</i>	<i>Std. err.</i>	<i>T</i>	<i>P> t </i>	<i>[95% conf. interval]</i>	
Error	1.000039	.568047	1.76	0.080	-.1228155	2.122893
_cons	-1.000217	3.184741	-0.31	0.754	-7.295469	5.295036

Notes: *Signifies 10% level of significance ** signifies 5% significance level *** signifies 1% significance level.

Now move towards the result of variance decomposition and impulse response. In this study we have taken the forecast period of 10 months, as our study was focussed only on the monthly data. During this analysis, we were assuming first 5 months as short term and last two months as long term in the period of forecasting. Variance decomposition is depicting that any stimulus present in for say Agriculture credit, the first period shows 100% variation through its own sector measures. However as time passes, this decomposition in the error starts decreasing slowly. As we reaches further in the long run,

share of explained agricultural impulse falls to 57% while the share of M3 internal impulse increased to 11% with a 14% increase in share of service section impulses and approximately 4% increase in central government debt as shown in Table 3. Same analysis is supported by the impulse response graph as shown in Appendix. It says that initially any unit impulse or shock in variable leads to the declining result of agriculture credit particularly due to the impulses in service sector. It also have theoretical validity. We know that for the growth of agriculture sector, service sector growth is the main input in the long run in terms of providing transport facility and markets for trade.

Table 3 Variable description

<i>Variable code</i>	<i>Description</i>
AGR CREDIT	It is the agriculture credit outstanding on monthly basis to the bank in rupees crore.
INDUSTRY	It is the monthly outstanding loan of micro, macro and large enterprise on the monthly basis.
PERSONAL_LOAN	It is the loan outstanding of personal sector such as consumer durables, vehicle loans, etcetera on a monthly basis at current value.
PRIORITY_SECTOR	It is the loan outstanding of priority sector such as housings, education loans, export credit, etcetera on a monthly basis at current value
SERVICES_CREDIT	Service sector include monthly credit outstanding of divisions such as tourism, hotel, infrastructure and many more.
GDP	It is the monthly measure of economic growth on current value or market price.
M3	It represents the monthly broad money supply by the banking sector in the economy. It includes all forms of money being circulated in the economy.
CENTRAL DEBT	This outstanding monthly debt represents the gross fiscal deficit of the government needed to pay back in rupees crore

Source: Author's analysis

If we look at the future period decomposition of central government debt, in first period after impulse agitation, 98% of the variation was explained by its own credit and an insignificant portion of 1.36% was shared by agriculture sector. As time passes by and we reach further in the long run, share of central funds fall to 78% which is also very significant and the share of M3 takes an increasing and upward movement towards 10%. But this share was insignificant in terms of its impact on central debt. Impulse response graph shows a different view. It says that as external stimulus impact and bring about a unit change in any of the variable, central debt shows a significant declining trend.

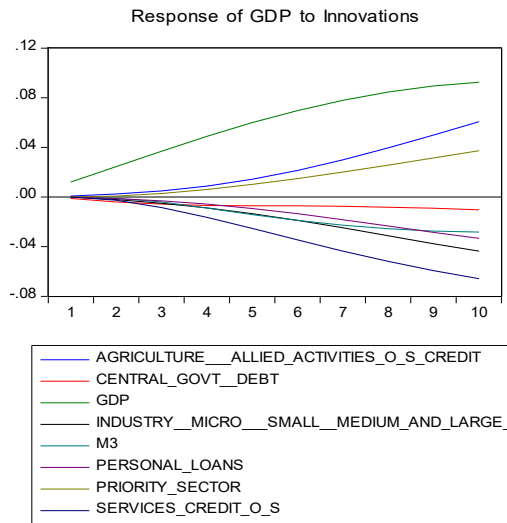
Now move towards the variance decomposition of GDP, in the short run 98% of the fluctuations were explained by its own funds and its reduction is also not significant. While in the long run 51% of the fluctuation was explained by its own and a significant share of 17% was shared by the service sector as shown in Figure6.

If we look at M3, its error term fluctuations in the short run was explained by its own variations and as time passes by, this percentage falls significantly. Whereas in the long run, most of these fall was equalised by an increase in the rate of central debt. Increase in

industrial fluctuations to 22% was also the main component of error decomposition in the model of M3.

Figure 6 GDP impulse response graph (see online version for colours)

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



Note: Representing time period on x-axis and Innovation on Y-axis.

Source: Author's analysis

Same fluctuations in other sectors were also visible as shown in Appendix.

Impulse response functions were also shown in the graph below. Most of the graphs depict the relations between variable with its response to a unit external shocks in any one variable by turn. The best impulse response relation was depicted by GDP in respect to any unit shocks in different sectors credit.

All the variables in the above graph shows the explosive mechanism over a period of time and interact with each other in the same direction with respect to impulses given in the graph. M3 shows the convergent behaviour with sectoral credit in the short run and a stable relation in the long run depicted below.

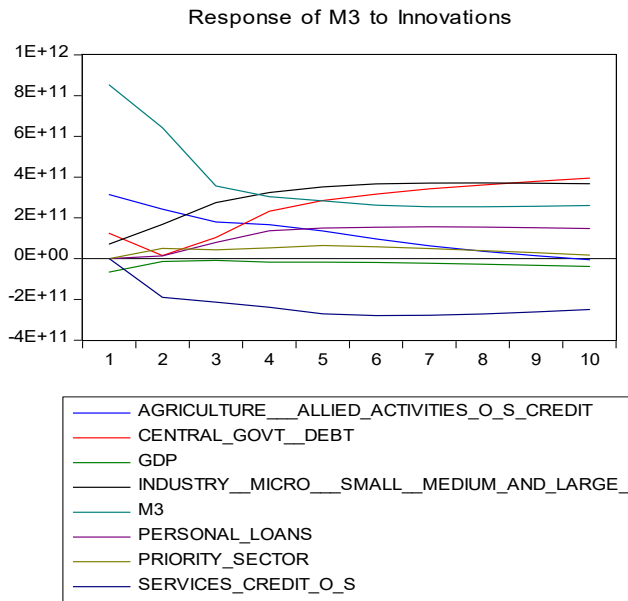
Rest of the impulse graphs were more or less same, having the movement in the same direction either upward or downward. So the results of impulse response strengthened the results of VECM to provide the meaningful reasoning.

So in the long run all of the tests imply that sectoral credit had a significant impact on economic growth even if any external stimulus is present. Now move towards the test result in short run. Over a short period of time, we had used the granger causality test over a lag period of 2 and 3 to detect the presence of relations between the variable and finding the reason for the occurrence of shocks. Their flow charts clearly show that there is no reverse causality between the variables. The flow of the causality is shown in the flow charts. The flow chart given below, depicts that any external stimulus in personal sector credit brings a significant changes in service sector. Also changes in service sector brings a positive change in industrial sector growth. Change in liquidity in the economy, i.e., M3 impacts the growth of every sector's credit and government debt which is

depicted in the third flow chart. It makes us to reject the null hypothesis of sectoral credits having no impact on M3 in the short term.

Figure 7 M3 impulse response (see online version for colours)

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



Notes: Representing time period on x-axis and Innovation on Y-axis.

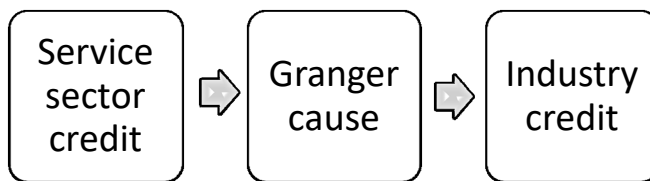
Source: Author's analysis

Figure 8 Causality flow from loan to credit (see online version for colours)



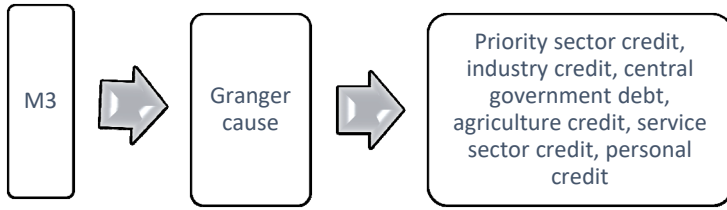
Source: Granger causality results shown in table in Appendix

Figure 9 Causality flow from service to credit



Source: Granger causality results shown in table in Appendix

Figure 10 Causality flow from M3 to types of credit



Source: Granger causality results shown in table in Appendix

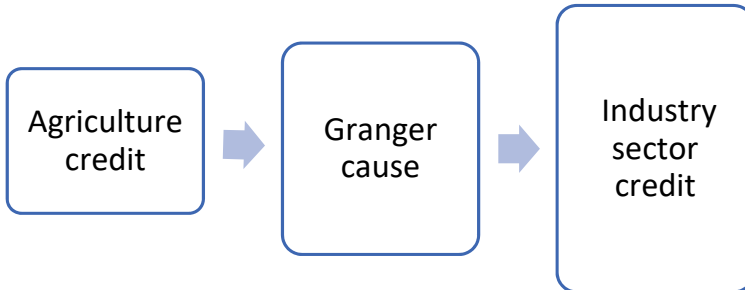
M3 more or less was impacting the growth of every sector in the economy. From this, it was inferred that the any change in short term liquidity impact the rate of credit growth in different sectors. Fluctuations in the GDP explains the changes in the central government debt while agriculture sector change affects the growth of industrial sector as depicted below.

Figure 11 Flow diagram from GDP to central debt (see online version for colours)



Source: Granger causality results shown in table in Appendix

Figure 12 Causality flow from agriculture credit to industry (see online version for colours)



Source: Granger causality results shown in table in Appendix

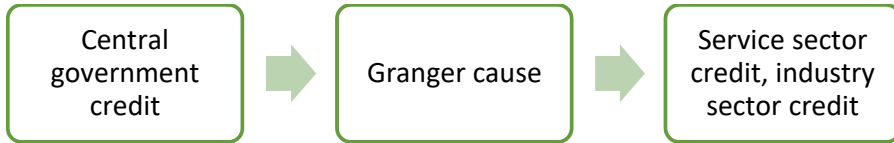
Also central debt fluctuations explains the changes in service sector and industrial sector as government always mainly focusses on growth of main contributor to GDP, i.e., Service sector and largest employment generator sector, i.e., industrial sector.

Similarly, changes in the priority sector loan impacts the contribution of agriculture, industrial and central government debt because if the literacy rate in the economy increases then the growth in the other sectors will be seen in terms of improved human capital. And at last but not the least industrial sector growth brings a positive change in GDP.

So in the long run and short run, test results indicate that increase in sectoral credit brings about a positive change in the economic growth and changes in economic growth

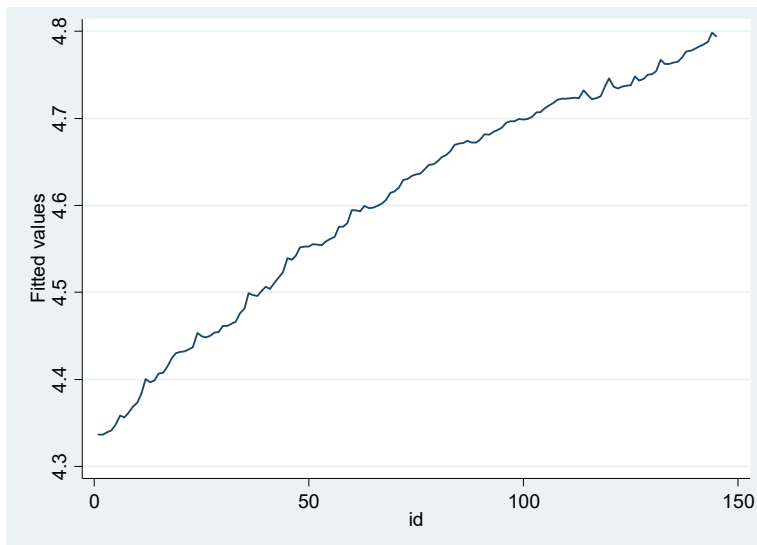
and liquidity brings a significant impact on a sectoral credit. In short period, some sectors like industry brings a positive change in the economic growth and each sector of the economy (like personal sector or agriculture sector) is positively and significantly impacted by the changes in the broad liquidity measure M3. But in the long run, each of the variable is impacted by the another and determined endogenously within the model. Results also says the any external shocks only impact the credit in the short run while in the long run stable equilibrium is achieved.

Figure 13 Causality flow diagram of central credit (see online version for colours)



Source: Granger causality results shown in table in Appendix

Figure 14 Plot of residuals against time variable (see online version for colours)



Now we will look at the overall impact of total credit on GDP by controlling for the exogenous changes.

Regression results with the constant suggest that, with the increase in credit rate, economic growth rate of the country falls by 0.4% which does not any logical reasoning. So, by suppressing constant we get the desired result where around 30% fluctuation of economic growth ere explained by credit disbursements by the banking institution for various sectors which is highly significant and have a positive impact on growth. This finding supports our theoretical underpinnings.

This plot shows that as we move further in the time period, error term increase by some positive value of mean and variance which shows that exogeneous change does

have a significant impact on economic growth. We also regress model errors on log GDP and get its coefficient value.

Value of error term is indeed significant at 10% level. So, we reject the null hypothesis of having an insignificant impact of exogenous change in the economy on growth level. We do observe the impact of let's say technological change on economic growth without directly impacting the credit level.

5 Conclusions

In GDP, we saw that sectoral credit without a trend have an insignificant long run influence. Hence, we have to accept that if we do not take trend into consideration, then our results will become biased. In the presence of trend, each one of our variables imposes a joint significant impact which was seen by the value of its coefficient. We have to accept the fact that in the short run also, all the sectoral credit growth impacts economic growth which in turn is significantly influenced by the increase of immediate liquidity in the economy called M3. Granger causality test proves this findings.

From our analysis, we have found that relations between the variable changes over a period of time. In the short run, main relation and impact was seen in the variables because of the change in liquidity. Change in sectoral loan was not the reason behind the initial cause of change. This results findings have many theoretical support. One of its argument includes that the government had taken steps to increases the amount of money holdings in the economy, to fight the slowdown. People were going to have more money in their hand which makes them willing to invest and save, in return to earn the interest on investments. Due to this increase in savings by the households, banking sectors have more amount of deposits to lend in the market. It increases the amount of loan with the various sectors of the economy comparatively at lower rate of interest. So in short period, M3 holds a great significance in the economy for the growth of GDP and sectoral credit.

Now look towards the longer term prospective. If the sectoral credit increases in the economy, then these respective sectors will focus on increasing its productivity and growth. Suppose Increase in agriculture loan makes the farmer adopt the modern technology and inputs at lower cost, which will in turn increases the output and growth rate of the sector. Increase in output by farmers raises the availability of raw materials for the industrial sector. Also, the credit sanction by the banks increases the capital availability jointly impacting the growth of the same. This rise in growth, again impacts the agriculture production and employment in the economy. Change in employment brings change in the standard of living which in turn increases the literacy rate. Banks also focuses on making the higher education available to everyone which comes under the section of priority sectors. So all of the sectors shares a part in the growth of each and every sector. However, there percentage of share may differ in their effects.

This interlinked growth continues to get impacted by each other thereby effecting the GDP level of the country as shown by the different VECM equations. We can therefore conclude that this significant relations between the variable makes the bank and government to think in this direction. And India, being the fifth largest economy in the world in terms of GDP, had taken the steps in this regards and planning on continue to do so in the future. Till now, we have only seen the unidirectional impacts of the following variable and its respective chains interwinding the every sector of the economy, be it the

government or private sector that starts from the small change in the level of liquidity. India is very well doing in this regards.

Now we consider its reverse direction results where the changes start from the rise in GDP level. Now think it like this, initially the change occurred due to change in M3 which leads to the growth in GDP. This impact does not end here. When the GDP of the economy changes, people of the country have more money in their hand in terms of profit to spend and save. It in turn increases the profit of the sector leading to the increase in the standard of living and liquidity of the economy.

VECM equations support this results and thereby we can say the each of the equation holds a joint significance among five or more variables leading to the long run stochastic trend with stable error adjustment process. However, we have to keep in mind that not all the variables are significantly related. For example, personal sector or priority sector are only significant in their own equations in which they act as a dependent variable. In rest of the six equations, there linkage is not highly significant meaning the proportion of impact is small in the economy. It means that their impact were only seen on their lagged values also including GDP and central government debt. All the variables shows a significant upward trend in the model which have a positive impact on first differenced dependent variables in the model. Also, there was a significant impact of credit on economic growth but there might be the possibility of endogeneity. But this problem of endogeneity is beyond the scope of our research and an objective for future research.

A common person is oblivious to this connection and makes unwise credit decision. It has been seen that irrespective of considering the needed amount of credit and creditor's position in terms of risk for paying the future instalments, sometimes creditor often take more loan from the bank in view of ease in interest rate and comparatively lesser payment. However, at the time of returning the loan, they raise their hands in the purview of bad debts and create the burden of non-performing assets on the bank in the economy. It makes the bank and economic system of the country to suffer heavy losses and non-payments. Thus a clear understanding of the credit market is needed for studying the actual impact of credit in the economy and this analysis was often done by the banking sector and various interested research institutions before providing credit sanctions in the market.

We all know that in India, banking sector is at developing stage and great efforts has been put by various authorities to resurrect it. A little effort on the part of government can make a big difference. There should be a credit literacy program to enlighten the credit takers about the impact of non-payment of loan on them and on the country. Such researches can be included in the curriculum of the students to enlighten them about the importance of the credit market in the economy. Money creation and loan sanction is an important part in the working mechanism of the market but not everyone was able to understands its importance.

5.1 Limitations and further scope of research

This research was done on the monthly basis for eight different variables which have low frequency data. This study period can be expanded by taking the daily data for research variables. Furthermore we have only included nine variables in our paper but it can be possible that some other variable which we have not find suitable as per our objectives can be useful for future perspective of studies. So researchers can expand future study by examining the impact of subsections of the credit sector also. For example, we have only

taken into account the industrial sector but for future research it can also be divided into sub-sections of small scale sector, medium scale enterprises, cottage industry and large scale enterprises. Same is the case in other sectoral credit like priority sector divided into education, health and so on, personal sector divided into home loan and vehicle loan and service sector divided into transportation, banking and hotel.

Also till now, we have only studied the banking section in India but researchers can also expand this study by undertaking the comparative study among different countries. We can also apply different tests other than used above like doing the panel against VAR analysis through developing the cross sectional time series data. A focus can also be placed to study aftermath of the impact and reasons for non-performing assets of the banking sector. Also, As we have observed, there might be the chance of endogeneity in the regression model so to deal with this we can also develop a better model for getting the more accurate results and predictions.

In the above research, GDP is used as a proxy for the economic growth but we all know that it is not its perfect measure. So if possible another measure of economic growth can also be used to carry out further research.

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Appendix*Abbreviations*

G1	GDP
G2	First lag of GDP or GDP(-1)
G3	Second lag of GDP or GDP(-2)
P1	First lag or personal loan(-1)
P2	Second lag or personal loan(-2)
T1	First lag or priority sector loan(-1)
T2	Second lag or priority sector loan(-2)
S1	Service sector outstanding credit first lag (-1)
S2	Service sector outstanding credit second lag (-2)
A1	Agriculture sector credit first lag (-1)
A2	Agriculture sector credit second lag (-2)
M1	Industry sector credit first lag (-1)
M2	Industry sector credit second lag (-2)
B1	Broad money (M3)
B2	Broad money first lag (-1)
B3	Broad money second lag (-2)
C1	Central government debt first lag (-1)
C2	Central government debt second lag (-2)
VECM	Vector error correction model
GDP	Gross domestic product
AIC	Akaike information criterion
SIC	Schwartz Information criterion
ADF	Augmented Dickey-Fuller test
PP	Phillip-Perron test
RBI	Reserve Bank of India
FED	Federal Reserve Bank
