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Bank Deposits in India – Econometric Analysis of Macroeconomic Determinants

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Abstract
In this paper, we examined various macroeconomic determinants of bank deposits in India using monthly data for period January 2011 to December 2015. The determinants are money supply, inflation, index of industrial production, Treasury bill rate, repo rate and stock market index measured by sensex, an index of shares of thirty companies listed in Bombay Stock Exchange. ADF and Phillips-Peron tests show that all variables are first difference stationary while Trace Test find 4 co-integrating vector at 4 lags. Hence Johansen Cointegration methods indicate that there is long run relationship among the variables and the Vector Error Correction model shows a satisfactory speed of adjustment. VECM estimates showed that money supply, index of industrial production and Treasury bill rates are statistically significant at various lags with the money supply having positive impact on the amount of deposits whereas IIP and Treasury bill rate have negative impact on deposits. Granger Causality test find that only index of industrial production granger cause deposits whereas deposits granger cause both money supply and Treasury bill rates. Impulse Response Function also shows similar results.
Keywords: Bank Deposits, macroeconomic determinants, Treasury bills rates, inflation, Money supply, Repo rate, Vector Error Correction Model, Granger Causality, and Impulse Response Function.

1. Introduction

Deposits are the amount of money which customers such as individuals, HUF, firms and governments keep with various deposits taking financial (commercial banks, mutual funds, etc.) as well as non-financial (non-banking finance companies, MFIs, post offices, etc.) institutions. Commercial banks play key role in deposits mobilization in India. Banks use these deposits to provide credit to various productive sectors of the economy. It also plays a key role in upliftment of priority sector which contributes in terms of raising income and employment to the people of lower income group. Banks are net lender to the government by investing in government securities thus supporting government expenditure.

Various other deposits taking institutions, such as, deposits taking non-banking finance companies (NBFCs), micro-finance institutions (MFIs), and mutual funds (MFs) have come up along with post offices which helped small depositors across rural and urban landscape to keep their savings safe and profitable. As on January 2016, while schedule commercial banks (SCBs) have total deposits of Rs.92.70 trillion, MFs Rs.10.82 trillion, post offices Rs.6.15 trillion (latest available on March-end 2014). This can be understood that though banks are facing competition by post offices, mutual funds and NBFCs, the share of its deposits is still around 90 per cent of total deposits mobilization, mainly due to various facilities provided by banks such as adoption of information technology like core banking solution (CBS), cheque truncation system (CTS), remittance, money transfers which has created fast customer service delivery. Adoption of national electronic fund transfer (NEFT), real time gross settlement system (RTGS), internet banking, mobile banking, etc., have further given banks a competitive edge over NBFCs, MFIs, MFs and post offices.

Deposits are of mainly three types, current, savings, term deposits. Current deposits which allows the depositors to do multiple transactions are helpful in businesses which need frequent daily transactions. Savings deposits which mainly caters to the need of common people to keep their savings and use it at the time of need. Depositors also get interest, though less, on this type of deposits along with various facilities like cheque book, debit card and internet and mobile banking. Term deposits in the form of various fixed deposits and recurring deposits, help depositors to invest their idle money for longer period to earn higher interest as compared with that of savings bank deposits. As of March 2016, 63.5 per cent of deposits of SCBs is term deposits and remaining 36.5 per cent in demand (savings and current) deposits. Now a days, to attract more deposits, banks are introducing various innovative schemes like flexi recurring deposits account in which customer have to deposits principal amount each time period like month and can also deposits additional amount. In addition, deposits in each persons' accounts of SCBs including RRBs, local area banks, branches of foreign banks functioning in India and eligible co-operative banks, are backed by insurance from Deposits Insurance Credit Guarantee Corporation (DICGC) up to Rs.1 lakh.

2. Objectives and Scope

In this study we attempted to examine the macroeconomic determinants of bank deposits within the context of fund mobilisation in India. We use vector autoregressive (VAR) based vector Error correction model (VECM) to find if there is statistically significant short term relationship between deposits and any determinants as well Granger Causality test to find the direction of causal relationship.

The study examines the deposits of the scheduled commercial banks including rural regional banks (RRBs). Deposits of NBFCs, MFs, MFIs, post offices, etc., are not considered for empirical examinations. The study covers the monthly data for the period January 2011 to December 2015 (60 time series points) available on Database on Indian Economy (DBIE) section of RBI website. For statistical analysis we used Vector Error Correction Model (VECM) method to estimate equation.

3. Literature Review

There are three major theories relating to savings behaviour: the traditional models of the life-cycle hypothesis put forward by Modigliani and Brumberg in 1954, the permanent-income hypothesis put forward by American economist, Milton Friedman in 1970 and the buffer-stock theory of savings behaviour by Angus Deaton and Christopher D Carroll separately in 1991 and 1992 respectively.

The life-cycle model of savings behaviour predicts that consumption in a particular period depends on the expectations about lifetime income which implies that people save in order to smooth consumption over time. Therefore, since income tends to fluctuate systematically over the course of a person's life, saving behaviour is determined by one's stage in the life-cycle. Individuals smooth consumption over their lifetimes, and are consequently, net savers during their working years and dis-savers during retirement. Hence the cornerstone of the life-cycle hypothesis is age-related consumer heterogeneity and the prediction that savings follow a hump shaped pattern, which is high at middle age and low at young and old ages [7].

The permanent-income hypothesis predicts that higher future income reduces current saving. In contrast to the life-cycle hypothesis, which predicts that consumption function depend upon consumer's lifetime income, the permanent-income hypothesis focuses attention on the income of consumer earned in recent past as well as expected future earnings. It also makes a distinction between permanent and temporary income. Temporary income changes are met by consumption smoothing whereby part of today's income windfall is saved to sustain higher spending tomorrow. Permanent income changes, on the other hand, do not justify current saving since more can be consumed now and in the future.

According to the buffer-stock theory of saving, consumers hold assets mainly so that they can shield their consumption against unpredictable fluctuations in income. The buffer-stock behaviour arises because when consumers face important income uncertainty, they are both impatient and prudence. Impatience means that if income were certain, consumers would like to borrow against future income to finance current consumption and prudence in the sense that they have precautionary motive.

Various studies have been done on the subject using different macroeconomic variables as determinants of deposits mobilisation. The study on Deposits Determinant on Commercial banks in Malaysia by Prof. Haron and Dr. Azmi (2006) classified variable into two, namely financial and economic variables. Financial variables consist of interest rates on savings account (RSCV) and fixed deposits accounts (ARFDCV), rates of profit for Islamic savings account (RSIS), and Islamic investment accounts (ARIIS) (fixed deposits accounts are normally known as investment account at Islamic banks). Whereas, based lending rate (BLR), composite index of Malaysian Bourse (KLCI), consumer price index (CPI), money supply (M3), and gross domestic product (GDP) are economic variables. The study on the determinants of bank deposits in Ghana by Out Larbi-Siaw and Peter Angmor Lawer used the growth of money supply, Consumer Price Index (CPI), the monetary policy rate (MPR), the All Share Index (ASI) and the interest rates on deposits (DIN) [6].

4. Methodology

4.1 Model Specification

Our study used various variables, such as, deposits, 91-days treasury bills rate, repo rate as monetary policy rate, money supply, index of industrial production as proxy of economic growth, consumer price inflation (CPI) as inflation rate and Sensex as stock market index for analysing the determinants of deposits in India.

4.2 Stationary Tests

Stationarity of a time series influences its nature. If the series X and Y are non-stationary then modelling of relationship $Y=a+bX+e$ between these two series will only generate spurious regression. Stationary time series implies that its mean and variance does not change over time. If the time series is not stationary, it can be made stationary by differencing at appropriate order. If a series is stationary at order 1, then it is said to be the series is integrated of order 1, written as I(1) and so on. Augmented Dickey Fuller Test and Phillip Peron Test are used to test the stationarity and order of integration of the series.

4.3 Determination of Lag Order

Once it is ascertained that some of the series used in the model are non-stationary, Ordinary Least Square (OLS) method of estimating regression equation may not be used, as it leads to spurious relationship among the variables. In such a case, VAR and VECM are other options of estimating the relationship. For this purpose, order of the lag is ascertained using various criteria, viz, AIC, SC, FPE, HQIC and LR tests. If the sample size is small, say less than 60, results of AIC and FPE are preferred to other methods; if the sample size is large say more than 60 then HQ and SC are preferred [14].

4.4 Existence of Co-integration and Determination of Number of Co-integrating Vectors

Co-integration is a statistical property of time series variables. If two or more series are individually integrated (in the time series sense) but some linear combination of them has a lower order of integration, then the series are said to be co-integrated. For example, if (X, Y, Z) are three time series variables, each integrated of order 1 or more, and there exist coefficients a, b, c such that aX + bY +cZ is integrated of order 0, then the series X, Y, and Z are co-integrated [1].

For checking the co-integration, we run OLS for the above-mentioned equation and check the presence of unit root in the residual series of the equation. If there is no unit root in the residual at the level, there exists co-integration among the series. If there is high Durbin-Watson statistic close to 2 and high R^2 close to 1, indicates the set if series is co-integrated.

Now the set of series is co-integrated, we need to determine the number of co-integrating relationships or vectors. For this purpose, Johansen's Co-integration criteria is employed. This criteria consist of two tests: the Maximum Eigenvalue Test and the Trace Test. The Criteria tests the null hypothesis of 'r' co-integrating relation against the alternative of 'r+1' co-integrating relation for r=0, 1, 2,…n-1.

The Maximum Eigenvalue Test Statistic is derived as follow:

$$LR\ max\ (r/n+1) = -T*\log(1-\lambda)$$

Where λ is the Maximum Eigen value and T is the sample size.

The Trace Test Statistic is as follow:

$$LR\ trace(r/n) = -T * \Sigma \log(1-\lambda)$$

When Maximum Eigenvalue and the Trace test give different result, result of the Trace Test is preferred [6].

4.5 Vector Error Correction Model

Existence of co-integration among the series implies that there is a long run equilibrium relationship between them. So we apply VECM to estimate the sort-run properties of the co-integrated series. Vector Error Correction Model (VECM) is Vector Autoregressive (VAR) based method with feature of correcting errors of the time series data to do the regression analysis. Various determinants of deposits, such as, money supply, deposits interest rate, repo rate and CPI based inflation rate are used for study. The 91-day treasury bills (TB) rate is used as a proxy of deposits rate. For the analysis, the data of monthly frequency from January 2011 to December 2015 (60 time points) is used [11, 13].

Adopting OLS method for regression requires the variables to be covariance stationary. That is the mean and variance of each series remains constant and do not change over time. However, many economic time series variables, such as, deposits, money supply, inflation index etc. are found to be non-stationary. Hence, adopting OLS to estimate the equation having non-stationary time series may generate spurious result. So, the first step in regression is to check the stationarity of the variables. If series is non-stationary, we check the order stationarity. Many economic and financial time series are found to be first difference stationary. Such process is known as integrated process of order 1, or I (1).

In our study, we first determine whether the series are stationary or non-stationary. The Augmented Dickey Fuller (ADF) test and Phillips- Peron test are used for the purpose. Deposits, CPI based inflation index, Treasury bill rates, money supply and Sensex are all non-stationary series and are integrated of the first order i.e. I(1). Since most of the series are non-stationary, it is not desirable to use OLS method for estimation which may generate spurious result. We can use VAR based Vector Error Correction Model (VECM) provided there is co-integration vector among the series. For this the first step is to determine the lag length for the equation. After determining the lag length the next thing is to find the number of co-integrating vector using Cointegration test of Trace Test and Eigen Value test. We can apply Cointegration test only if series are integrated of the same order. Here all series are integrated of first order so we can apply Cointegration test. For a model containing n variables. There can be at most n-1 cointegrating relation. After determining number of cointegrating relation and lag length it is ideal to apply error correction model which provides long run relationship and short run dynamics. The major thrust of the error correction model is to adjust the error and then estimate the result. The error may be caused due to various factors, such as, misspecification of the equation, etc. A negative and significant coefficient of ECM indicates that any short-run fluctuations between the independent and the dependent variables will give rise to a stable long-run relationship between the variables.

4.6 Granger Causality

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another, first proposed in 1969 by Engel and Granger. A time series X is said to Granger-cause Y if it can be shown, usually through a series of t-test and F-test on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y.

It is used to test whether the past values of variables like money supply is useful in explaining the current values of another variable like output. A general specification of the Granger Causality Test in bivariate context may be expressed as:

$Yt = a0 + a1Yt\text{-}1 + \ldots\ldots + aiYt\text{-}i + b1Xt\text{-}1 + \ldots\ldots\ldots\ldots\ldots + biXt\text{-}i + u$ (1)

$Xt = a0 + a1Xt\text{-}1 + \ldots\ldots + aiXt\text{-}i + b1Yt\text{-}1 + \ldots\ldots\ldots\ldots\ldots + biYt\text{-}i + u$ (2)

In the model, the subscript denote time periods and u a white noise error. a0 denotes the constant growth rate of Y in (1) and X in the equation (2). Thus the trend in these variables can be interpreted as general movements of cointegration between X and Y that follows the Unit Root Process. We can obtain these tests from the analysis: the first examines the null hypothesis that the X does not Granger cause Y and the second test examines the null hypothesis that the Y does not Granger cause X. If we fail to reject the former null hypothesis and reject the later, then we conclude that X changes are Granger caused by a change in Y. As co-integration between two variables does not provide the direction of causal relationship. F-statistic and probability values constructed under the null hypothesis of non-causality show that there is a causal relationship between those variables [6]. Unidirectional causality will occur between two variables in either null hypothesis of equation (1) or (2) is rejected. Bidirectional causality exists if both null hypothesis are rejected and no causality exists if neither null hypothesis in (1) and (2) is rejected.

4.7 Impulse Response Function

The study uses impulse response function as an additional check of the co-integration test's findings. Impulse response functions are used to describe how the economy reacts over time to exogenous impulses, which usually called shocks, and are often modeled in the context of a vector autoregression. Impulses that are often treated as exogenous from a macroeconomic point of view include changes in government spending, tax rates and other fiscal policy parameters; changes in the monetary base or other monetary policy parameters; changes in productivity or other technological parameters; and changes in preferences, such as the degree of impatience. Impulse response functions describe the reaction of endogenous macroeconomic variables such as output, consumption, investment and employment at the time of the shock and over subsequent points in time.

5. Stylized Facts and Descriptive Analysis

5.1 Stylised Facts

Charts (1-5) show the trend in deposits growth with changes in other variables.

Chart 1 shows the trend in growth rate of deposits with changes in repo rate over five years from January 2011 to December 2015. It can be seen from chart that, there is no direct impact of change in repo rate on deposits.

Chart 2 shows the impact of inflation on the growth rate of deposits. It can be seen from chart that as inflation increases in 2012, deposits growth decreases and with moderation in inflation deposits growth increases.

Chart 3 shows the growth rates in deposits and the money supply in India, measured by M3 or Broad Money. The chart shows a close resemblance between growth in money supply and growth in deposits of commercial banks.

Chart 4 shows the trend in growth in deposits and 91-day Treasury bill rate which is taken as a proxy for rate of interest on deposits. Over the years, trend in the growth rate of deposits and treasury bill rate has decreasing trend.

Chart 5 shows the relationship between deposits growth and year-on-year growth in Index of Industrial Production, taken as proxy for economic activities. A closer look reflects negative relationship between IIP and deposits. This may be due to higher economic activities requires more money for the purpose of working capital.

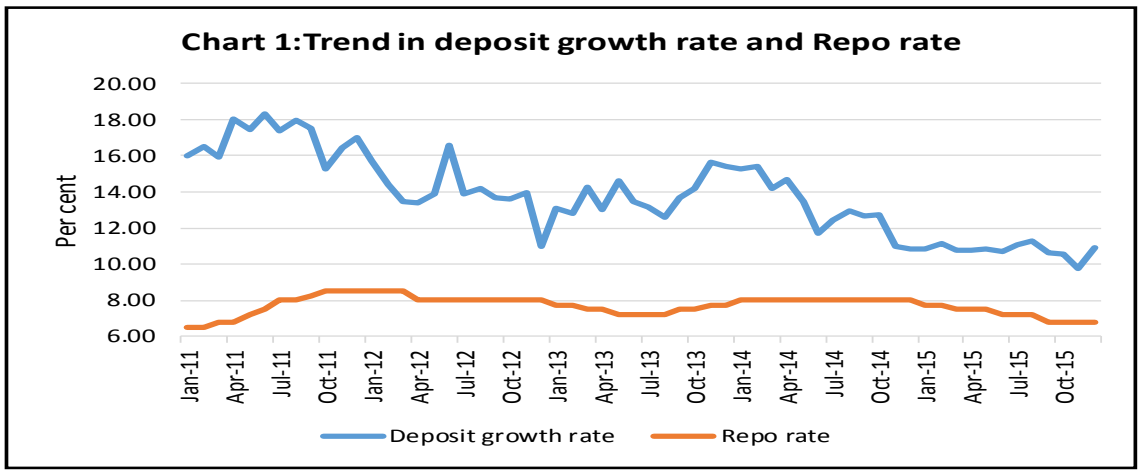
Chart 1:Trend in deposit growth rate and Repo rate
Per cent
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
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Jan-15
Apr-15
Jul-15
Oct-15
Deposit growth rate
Repo rate

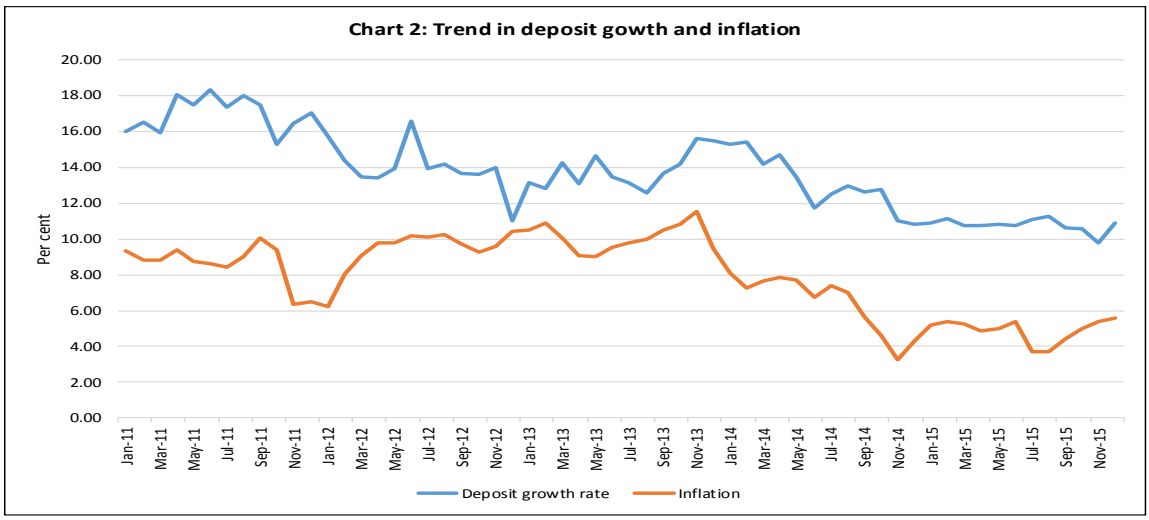
Chart 2: Trend in deposit gowth and inflation
Per cent
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Mar-13
May-13
Jul-13
Sep-13
Nov-13
Jan-14
Mar-14
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Sep-15
Nov-15
Deposit growth rate
Inflation

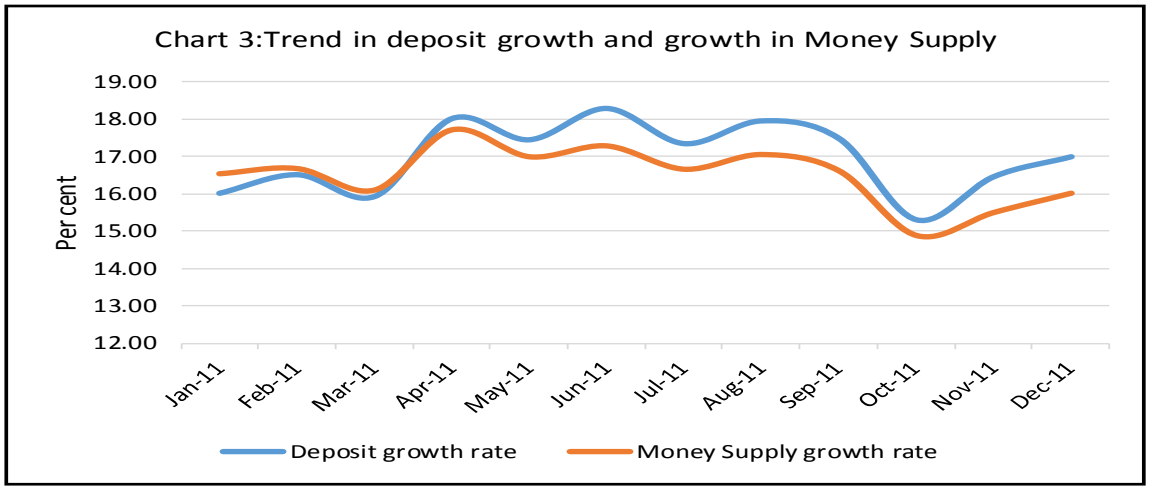
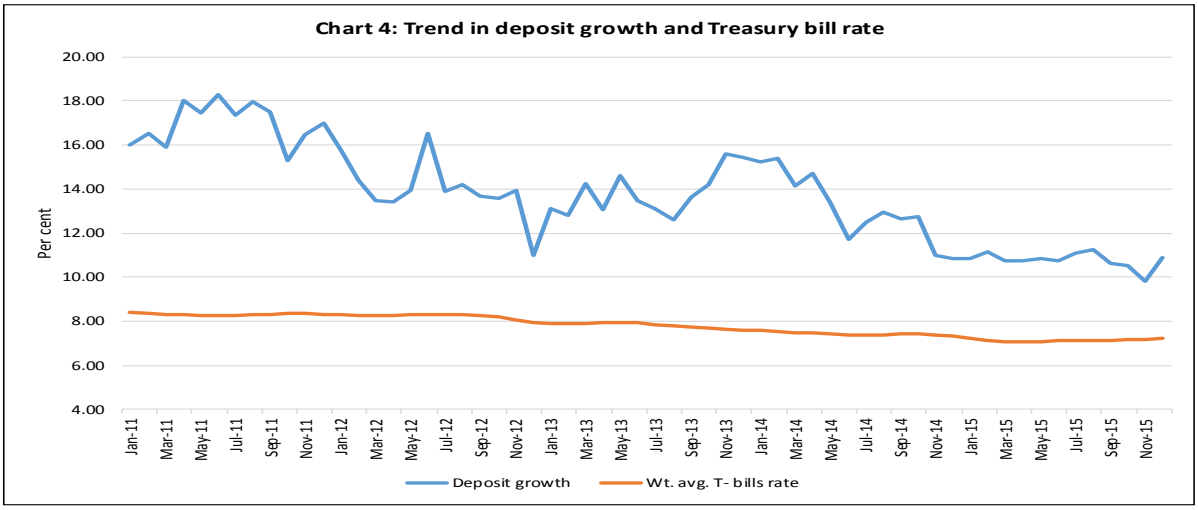
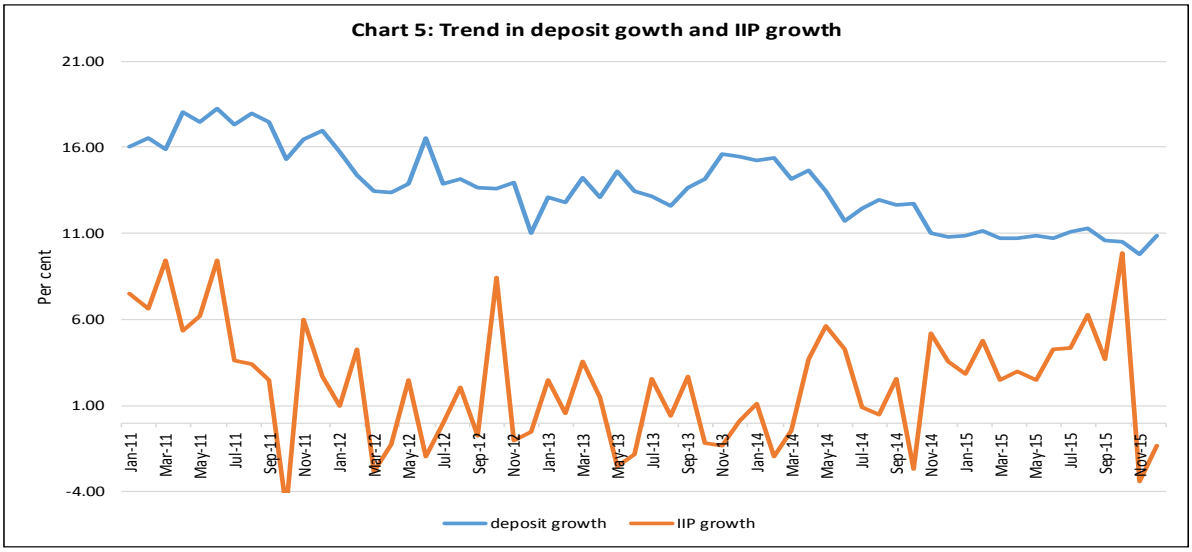


Chart 3:Trend in deposit growth and growth in Money Supply
Per cent
19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Deposit growth rate
Money Supply growth rate





5.2 Descriptive Analysis

Deposits in India continues to grow during the period under review 2011-15. In this context, it is mentioned that the labor force of the country continues to increase and with increase in income people are left with idle money, a portion of which they keep as bank deposits in both savings account and as investment in term deposits. With the increase in bank branches and the other modes of banking, scope of peoples' connectivity with banking increased manifolds and thereby transactions with the banks. Throughout the period 2011 to 2015, a great emphasis has been made by RBI as well as banks to open branches. A major of these has been opened in semi-urban and rural areas with a few or no branches. This proved to be a major impetus to increase the bank deposits. The government launched Prime Minister Jan Dhan Yojana (PMJDY) in August 2014 to link those people, who doesn't have access to formal connectivity with banking channel. Since then almost 20 crore bank accounts has been opened under the scheme. Though, almost 70 per cent of these bank account had zero balance in initial stages, the ratio has reduced to 30 per cent afterwards. Inflation remained high during three years between 2011-14 inflation, while it moderated after January 2015.

Table 1: Summary Results of Descriptive Statistics

	Inflation based on CPI	Log(Deposits)	Log(IIP)	Log (M3)	Log(Sensex)	Repo Rate	Treasury Bill Rate
Mean	7.66	11.20	5.16	11.42	9.98	7.75	7.92
Median	7.80	11.22	5.15	11.43	9.93	8.00	7.95
Maximum	11.51	11.43	5.29	11.64	10.27	8.50	8.42
Minimum	3.27	10.94	5.09	11.16	9.68	6.75	7.14
Std. Dev.	2.36	0.15	0.05	0.14	0.19	0.46	0.39
Skewness	-0.19	-0.14	0.59	-0.13	0.09	-0.51	-0.36
Kurtosis	1.67	1.76	2.67	1.78	1.52	2.86	1.64
Jarque-Bera	3.98	3.35	3.12	3.25	4.64	2.22	4.92
Probability	0.14	0.19	0.21	0.20	0.10	0.33	0.09
Sum	382.94	560.12	258.15	570.81	499.23	387.25	396.11
Sum Sq. Dev.	271.88	1.03	0.12	0.99	1.80	10.31	7.49
Observations	50	50	50	50	50	50	50

CPI: Consumer Price index; M3: Broad Money Supply.

The Skewness which measures the asymmetry of the distribution around its mean, is negative, except in case of LIIP and LSNSX. This is an indication that the distribution has a long left tail. The kurtosis measures the flatness or peakedness of the series. The results shows that the LIIP and Repo satisfies the condition, that is close to 3. The other four variables have value less than 3. The result from the Jarque-Bera Test indicates an acceptance of the null hypothesis that the random variables are normally distributed.

6. Statistical Analysis and Discussion

6.1 Testing Stationarity of the series

Table 2 below sets out the results of Unit Root Test for testing stationarity of various time series. Except index of industrial production (IIP), all the series (deposits, inflation, Treasury bill rate, Money supply, Sensex and repo rate) indicate the presence of Unit Root at level in both Augmented Dickey Fuller Test as well as Phillips-Peron test. Hence all the series (except IIP stationary at level also) are first difference stationary and the series are integrated of order one i.e. I (1). Since series are non-stationary, the OLS method for estimation may not be applied, instead we apply VAR based Error Correction Model provided there is co-integration among the series.

Table 2: ADF and PP Unit Root Test for series

The Null hypothesis: The series has a unit root

Series	ADF Test		Phillips- Peron	
	Level	First Difference	Level	First Difference
Log(deposits)	-1.24 (0.64)	-9.20 (0.00)	-4.85 (0.0002)	-10.36 (0.0000)
Treasury Bill Rate	1.41 (0.99)	-5.00 (0.0002)	0.61 (0.9888)	-3.28 (0.0213)
INF	-1.96 (0.30)	-5.02 (0.0001)	-1.25 (0.6440)	-4.77 (0.0003)
Log (IIP)	-5.24 (0.0001)	-7.41 (0.000)	-5.49 (0.0000)	-13.24 (0.0000)
Log (M3)	-1.34 (0.5991)	-7.45 (0.0000)	-3.15 (0.0289)	-9.31 (0.0000)
Log (Sensex)	-1.08 (0.7131)	-8.13 (0.0000)	-1.07 (0.7182)	-8.02 (0.0000)
Repo Rate	-1.88 (0.3380)	-3.77 (0.0059)	-0.908 (0.772)	-7.29 (0.0000)

Figure in brackets denotes the probability value (p-value) for the Statistic.

6.2 Determination of Lags

The lag length determines the number of lags, the AR process required for the test of serial correlation. Table 3 reports lag order statistics. The statistic shows lag order at 4. So we produce further tests with lag 4. Here, the sample size is less than 60, we can follow the lag length as indicated by FPE and AIC criteria [14]. Hence the chosen lag length is 4.

Table 3 : Lag Order Selection
Sample: 2011M11 2015M12; Included observations: 46

Lag	LogL	LR	FPE	AIC	SC	HQ
0	412.6773	NA	8.44e-16	-17.68162	-17.44310	-17.59227
1	699.1977	485.8389	1.59e-20	-28.57381	-26.90418*	-27.94836
2	751.1163	74.49195	8.64e-21	-29.26593	-26.16519	-28.10437
3	795.2538	51.81358	7.55e-21	-29.61973	-25.08788	-27.92207
4	851.5153	51.36914*	5.02e-21*	-30.50066*	-24.53770	-28.26690*

* 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

6.3 Determination of Number of Co-integrating Vectors - Co-integration rank is estimated using Johansen Criteria which is based on two likelihood estimators – a Trace test and a Maximum Eigenvalue test. The results are presented in Table 4.

Table 4: Determination of Number of Co-integrated Vectors
Series: INF LDEP LIIP LM3 LSNSX REPO TBR
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.691404	178.7791	125.6154	0.0000
At most 1 *	0.590490	122.3444	95.75366	0.0002
At most 2 *	0.441474	79.49027	69.81889	0.0069
At most 3 *	0.383020	51.53243	47.85613	0.0217
At most 4	0.297226	28.35233	29.79707	0.0727
At most 5	0.188777	11.42178	15.49471	0.1868
At most 6	0.028332	1.379579	3.841466	0.2402

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.691404	56.43463	46.23142	0.0030
At most 1 *	0.590490	42.85415	40.07757	0.0237
At most 2	0.441474	27.95784	33.87687	0.2155
At most 3	0.383020	23.18010	27.58434	0.1659
At most 4	0.297226	16.93055	21.13162	0.1753
At most 5	0.188777	10.04220	14.26460	0.2092
At most 6	0.028332	1.379579	3.841466	0.2402

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Trace Statistics indicates 4 co-integrating vector whereas Maximum Eigenvalues indicates 2 at 5% level of significance. Since the number of cointegrating vectors differs in both the criteria, we followed the Trace Test Criterion and will use 4 co-integrating vectors in estimation through VECM [1].

6.4 Estimation of Vector Error Correction Model
The presence of co-integration between variables suggest a long term relationship among the variables under consideration. Therefore VECM can be applied to estimate the long-term relationship between amount of

deposits, interest rates, inflation, money supply, stock index, policy rate, index of industrial production. The estimated VECM is as follow:

DLDEP =0.027448 + 7.924430 ECT2 – 8.1060 ECT4 – 8.2088 DLDEP(-1) – 6.4952 DLDEP(-2) + 7.8348 DLM3(-1) + 6.0763 DLM3(-2) – 0.3420 DLIIP(-2) – 0.2549 DLIIP(-3) – 0.1499 DTBR(-4)

Where:
DLDEP=change in log of deposits
DLDEP(-1)= Change in log of deposits at lag 1 period
DLDEP(-2)= Change in log of deposits at lag 2 period
ECT2=Error correct Term for second cointegrating equation
ECT4=Error correct Term for fourth cointegrating equation
DLM3(-1) = Change in log of broad money supply at lag 1 period
DLM3(-2) = Change in log of broad money supply at lag 2 period
DLIIP(-2)= Change in log of index of industrial production at lag 2 period
DLIIP(-3)= Change in log of index of industrial production at lag 3 period
DTBR(-4)= Change in Treasury Bill Rate at lag 4 period

Since the variables are in log form, the coefficients can be interpreted as short-run estimates of elasticity. A 1 percentage point incremental growth in money supply (M3) boosts deposits by 7.8348 percentage points incrementally (growth on previous period growth) with a lag of one month. However, at 2-months lag, 1 percentage point incremental increase in money supply (M3) increases the deposits by 6.0763 percentage points incrementally. Similarly, a 1 percentage point incremental increase in IIP will decrease deposits by 0.3420 percentage points incrementally with two lag and decrease of 0.2549 percentage point with 3-months lag. A 1% incremental increase in Treasury bill rate decreases deposits by 0.1499 percentage points with lag of 4 months. The significance of coefficients is tested at 5 percent level of significance.

6.5 Granger Causality Test

The following Table 5 summarises the pair-wise causality analysis. There is unidirectional causality running from deposits to money supply as well as to Treasury bills rates. It indicates that that the past values of deposits have a predictive ability in determining the present values of Treasury bill rate and the money supply. On the other hand, index of industrial production (IIP) Granger cause deposits as well as money supply, means any change in IIP will cause change in deposits and money supply. There is bi-directional Granger causality between Inflation (INF) and stock market index (LSNSX). Money supply and the Repo rate Granger causes Treasury bill rates.

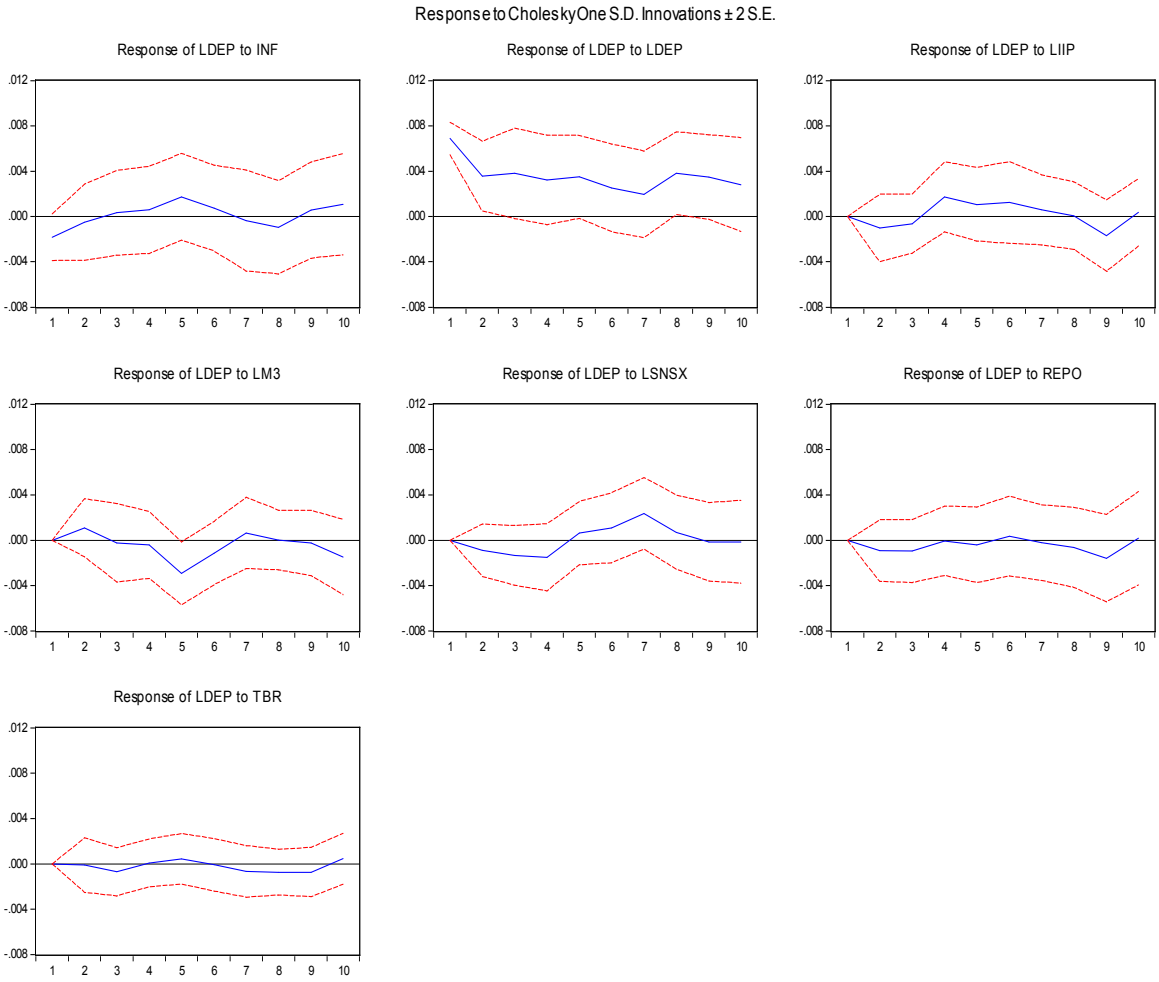
Table 5: Granger Causality Test

Null Hypothesis*	F-Statistic	Probability	Result
Deposits does not Granger cause TBR	3.0953	0.0270	Reject
Deposits does not Granger cause LM3	3.4040	0.0181	Reject
LSNSX does not Granger cause INF	4.9276	0.0028	Reject
INF does not Granger cause LSNSX	3.0209	0.0298	Reject
LIIP does not Granger cause LDEP	2.6819	0.0465	Reject
LIIP does not Granger cause LM3	3.5378	0.0153	Reject
LM3 does not Granger cause TBR	3.8427	0.0104	Reject
Repo does not Granger cause TBR	3.6037	0.0141	Reject

*The hypotheses mentioned above were rejected at 5% level of significance.

6.6 Impulse Response Function

The initial response of deposits to a unit shock in inflation is negative for three time-periods and then becomes positive for two time-periods and repeats its cycle. In a similar way, a unit shock in IIP cause negative response up to three months then it becomes positive till 8th month. It is proven that LIIP Granger cause LDEP. However, LDEP Granger cause LM3 and TBR. Shock in money supply affects positively on deposits in second and it dies out from third month onwards. A unit shock in Sensex cause negative response till fourth month before becoming positive and then the response died out from ninth month onwards. A shock in repo results negative impact on deposits up to third month and after its effects are minimal. A shock on TBR has no response from third months onward.



7. Conclusion

The study analysed the impact of various macroeconomic determinants on bank deposits. The variables we considered are money supply, index of industrial production, inflation, Treasury bill rate, repo rate and sensex index. The variables were found to be first difference stationary so the OLS technique has not been used to estimate the relationship among them. The presence of co-integration showed that there is long run relationship among the variables and enabled us to adopt vector error correction model to estimate short run elasticity by adjusting the error. It can be concluded that in the short-run, increasing money supply has positive impact on the amount of deposits whereas IIP and Treasury bill rate have negative impact on deposits. The Granger Causality test show that only IIP Granger cause deposits while deposits Granger cause both money supply and Treasury bill rate. Impulse Response Function also shows similar results. The paper thus empirically showed that bank deposits are determined by various macroeconomic variables.

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