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A STUDY ON EFFECT AND IMPACT OF BANK RATE VOLATILITY IN FINANCIAL MARKET IN INDIA

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ABSTRACT

Bank rate adjustments made by RBI with the aim of reducing the rupee volatility during 2013-14 increased the gap between the relative values of assets and liabilities ALM in banks This research explores the impact of bank rate volatility in ALM. Based on the RBI data collected for the period 2012-14, we measured the impact of bank rate on ALM by applying variance analysis and estimated the relationship with Granular model. We found that bank rate influence the volume of liquidity flows but not the value of cash flows. Hence to reduce ALM gap the costs of cash outflows could be managed in accordance to bank rate. In other way, the ALM gap can be narrow down by balancing long-term deposits and loans during the bank rate revision period.

KEYWORDS :*Bank Rate Volatility , Financial Market , environment.*

INTRODUCTION

Every reform over a period is changed in all the factors of the environment. In India, as compared with others, there is also a marvellous development in the Indian money markets. The financial institutions have been available to meet up with the enormous amount of expectations of funding in all the sectors of the country. They had also been able to meet the expectations of short-term funding of key sectors such as Agriculture, Industry and Services.

The commercial banking sector plays an important role in mobilization of deposits and disbursement of credit to various sectors of the economy. A sound and efficient banking system is a condition for maintaining financial stability. The financial strength of individual banks, which are major participants in the financial system, is the first line of defence against financial risks. The banking industry in India is undergoing transformation since the beginning of liberalization. Banks in India are venturing into non-traditional areas and generating income through diversified activities other than the core banking activities. There have been new banks, new instruments, new windows, new opportunities and, along with all this, new challenges. While deregulation has opened up new vistas for banks to augment revenues, it has entailed greater competition, reduced margins and consequently greater risks.

Banks enter into off balance sheet (OBS) transactions for extending non-fund based facilities to their clients, balance sheet risk management and generating profits through leveraged positions. OBS exposures of banks, especially public sector banks have witnessed a phenomenal spurt in recent years. Scheduled commercial banks (SCBs) off-balance exposures comprise of guarantees, letters of credit, derivatives contracts, etc. The share of off-balance sheet exposures of SCBs in total liability increased sharply to 333.5 per cent at end-March 2008 from 68.7 per cent at end- March 2003. Public sector banks (PSBs), which are perceived to have a low-risk appetite, have the lowest ratio of off-balance sheet exposure to total assets ratio at 61 per cent, compared to 251 per cent for private sector banks and 2,803 per cent for foreign banks. Commercial banks witnessed high credit growth in three years in succession staring from the financial year 2005-06. Although, with deregulation of interest rate and opening of new instruments and products, traditional Asset Liability Management technique has undergone a radical change. Mismatch of Asset and Liability in various ways may affect banks viability. With the recent global turmoil, slowdown in the growth of our economy and rising off balance sheet exposure of the banks, it is very important to explore the interrelation between two sides of the balance sheet, asset account and liability account.

Over the past two decades operations under the regulation and the control of the Reserve Bank of India (RBI) in the Indian market has also presented the required elasticity and required maturity. Even the stakeholders of the banks are considering the money market rates while investing in banking companies, where the money market of the Indian region has grown to a marvellous height.

In the case of sustainability of the bank, there has been an incessant revision in the bank rates and other supporting rates of the bank. In the financial period of 2012-13, the number of revisions that were made by the monetary policy regulator (RBI) was six revisions as compared to the previous were two revisions, as these revisions in bank rate were tacit with the aim of curtailing the volatility in rupee value. According to the notifications of RBI, the non-performing assets were increased from 3.3% to 4% in financial period 2013-14. In the same period the liquidating deposits in one year to total deposits was increased by one third time.

According to the view in controlling the rupee volatility was predominant in static, there was an increase in the gap between the asset and liability of the banks. The gap has been increased to twice from its previous gap in the liquidity squeeze period. The gap in ALMs is due to the increasing deviation in the tenors of loans and deposits.

On public sector banks, there is a shortage of a ready security that could be utilised to REPO with the Reserve Bank in a liquidity squeeze period. The India rating of the economic times reports quoted that the trend of increasing funding gaps in the banking system is unjustifiable, mainly as the economic restoration may want sustained bank funding for longer tenor infrastructure loans.

2. KNOWLEDGE GAP

The liberalisation measures have increased competition and eroded banks' market power. RBI has been successful in its implementation of various measures to improve the transparency in the corporate governance of public sector banks in order to broad base ownership and control. (Lakshmi, 2011). The monetary policy changes are having more impact on short-term and medium-term lending. (Sumon Kumar Bhaumika, September 2011). The banks with lower charter values tend to have lower equity–assets ratios (lower solvency) and to experience higher credit risk (Vicente, 2003). Macro interest-rate unpredictability found to have a significant effect on bank. Macro policies reduced interest-rate volatility (Anthony, 2000). The bank rate influences the credit policy (Fasea, 1995). The transparency of ALM decreases the chance of severe banking problems and improves overall financial

stability (Nier, 2005). Jurg's research contended that a reduction in debt service lowers bank equity, and, because of capital adequacy requirements, this in turn reduces bank lending and industry investment. (Jurg blum, 1995). Banks with lower charter values tend to have lower equity–assets ratios (lower solvency) and experience higher credit risk (Vicente Salasa, December 2003). In Indian banking system, the use of technology, increased availability of lendable resources, heightened competition, a trend towards the market-driven interest rate system and improve the asset quality (Sunil Kumar, 2014). Rangan's research quote that there is a relation between NPA's and interest rates. (Rangan, 2012). Research conducted on ALM revealed that 2/3rd banks are not exposed to interest rate risk. Houston's research found that the relationship between bank borrowing and the importance of growth opportunities depends on the number of banks the firm uses and whether the firm has public debt outstanding based on the bank rate. (Houston, 1996). But the present research aims to identify the relationship between Bank rate adjustment's impact on the assets and liabilities of the banks

3. STATEMENT OF THE PROBLEM

The RBI has done seven revisions in the Bank rate during the financial year 2005-14 ; while it was two revisions in the previous year, even though, the revisions in bank rate aimed at curtailing the rupee volatility, the gap in Asset and Liability of banks increased by two times (CRISL, 2014). The NPA increased to 4% in 2005-14 from 3.3% (RBI, 2014) the deposits liquidating in one year to total deposits had shown one-third increase (BS, 2013). The rupee value depreciated to Rs 62 per US dollar during December 2014. The BSE' Bankex surged to 10077 at the end of december 2014. RBI was forced to control such volatility in the economic indicators. In this context, the present research was done with the purpose of identifying the cascading effect of bank rate volatility in rupee-dollar value and BSE's Bankex during the liquidity squeeze period.

4. OBJECTIVES

4.1 Macro objective

To analyse the relationship between bank rates and bank's share price movement

4.2 Micro objective

To address the effect of bank rate adjustments in the Assets and Liability management metrics of Indian banks and to find out the gap created between assets and liabilities by the Bank rate.

4.3

The primary objective of the research is to portray the effect of bank rate among the exchange rate and Bankex. The facilitating objectives are to answer the following queries.

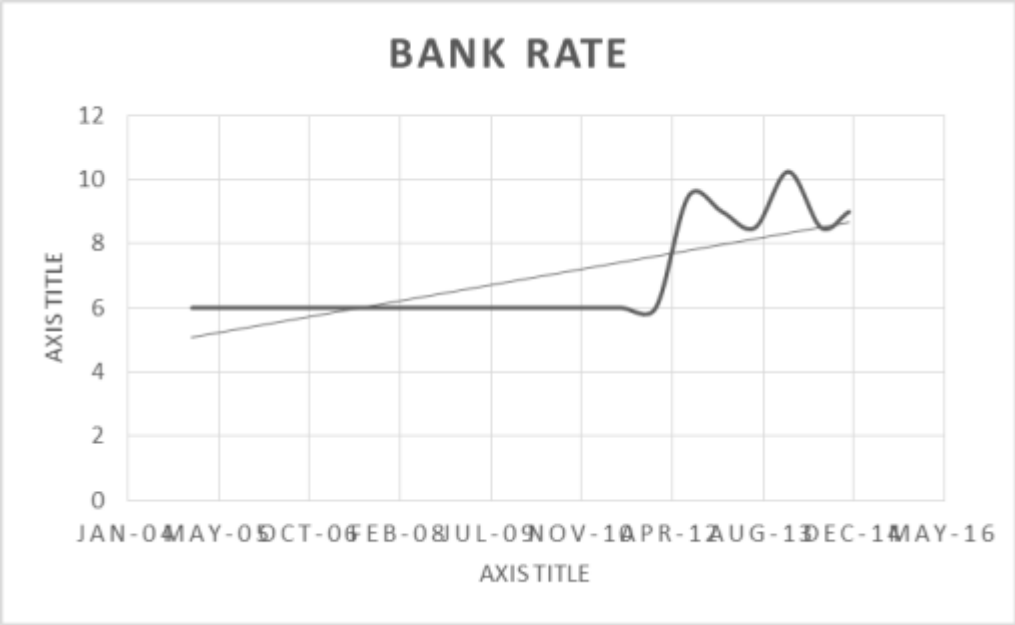
<< Is there any variations among the exchange rate and Bankex, when the Bank rates are revised. Whether the variations are equally distributed among the bank rate revision periods?
<< Is it possible to predicate exchange rate or Bankex with bank rate?
<<What is the outcome of bank rate revisions on exchange rate and /or Bankex if there is any predictability.

5. METHODOLOGY

India's banking sector could become the fifth largest banking sector in the world by 2020 and the third largest by 2025. The assets and liabilities value of the Indian banks are expanding. We collected the total value assets, liabilities and cash flows value of 232 banks from the RBI database for

the period between April 2012 and March 2014 on a monthly basis. Bank rate announced by the RBI is considered as the independent variable. The bank rate has been revised nine times during the study period. The exhibit-1 shows the bank rate revisions made by RBI.

Exhibit-1: Bank Rate Revisions



The analyses have been conducted in three stages. In the first stage, the variations between the ALM variables (the total value of the assets, liabilities and cash flows of the banks) and bank rate are identified by using "F" test. In the second stage, the relationship between ALM variables and bank rate are predicted using Granular model. Under the Granular model, idiosyncratic volatility is constructed by first removing the correlated component of bank rate with a statistical factor model, and then volatilities of the residuals are calculated using the following equation (Bekaert, Hodrick, and Zhang (2010).

$$V_t(g^{res}_{i,t+1}) \approx \sigma^2_\varepsilon \left(1 + \frac{1}{p_{i,t}}\gamma^2 H_t - \left[\frac{S_{i,t}}{NE[S_{i,t}]} + \gamma H_t\right]^2\right)$$

The R2 value of Granular model is calculated for each ALM variables. If the R2 values are greater than 0.7, then we assume that the ALM variables are influenced by the changes in bank rate. In the third stage, we use the homogeneity test using Levene statistic and Brown-Forsythe statistics to find out the group variance within the ALM variables having R2 values greater than 0.7. The significance of the test implies that ALM variables grouped based on the bank rate revision periods have unequal variations. For a cash flow analysis, only "F" test was performed as they are highly volatile due to external factors other than the bank rate. The output of the stages is used to determine the impact of the bank rate on ALM variables.

6. RESEARCH DESIGN

Stage	Purpose	Input	Process	Output
1.	Relationship between bank rate and other rates	Repo rate Inflation Exchange rate Bankex	To find out the correlation	Bank rate-exchange rate ,inflation, repo rate Repo rate-bank rate
2.	Co integration between bank rate and other rates	Repo rate Inflation Exchange rate Bankex	To find out the co integration	Repo rate-inflation, exchange rate Inflation-bank rate
3.	Granger causality test	Repo rate Inflation Exchange rate Bankex	To find out causality test	Bank rate Vs exchange rate has F-statistic 21.53 and probability of 0.02 Exchange rate Vs repo rate has F-statistic 23.37 and probability of 0.01

6.1 Impact on Assets

Total banking assets in India stood at US$ 1.8 trillion in FY13 and are projected to cross US$ 28.5 trillion in FY25. Interest rate is sensitive and correlated with assets and liabilities. This widens the Assets and Liabilities gap (James, 1984). To study the relationship between the Bank rate and assets, we identify the twenty-seven liquid assets values on a monthly basis, and they are grouped based on the bank rate revision periods. We apply 'F' test to assess that whether the group means of assets values as classified based on the bank rate differs significantly from each other. Bank rate has been considered as an independent variable. There exist nine groups; as the bank rate was revised nine times during 2012 and 2013. Two revisions are made with the same value; hence seven groups are created. The square of the deviation of each group mean of external factors from the overall mean in the corresponding group is considered as “between-group sum of squares” (BSS). The square of the deviation of each observation from the corresponding group of external factor mean is considered as “within group sum of squares” (WSS). We establish the statistical hypothesis of ANOVA as follows:

H0 (Null Hypothesis) = There is no significant variation between the assets value as grouped based on the bank rate.
Ha (Alternative Hypothesis) = There is a significant variation between the assets value factors as grouped based on the bank rate.
In order to test the above hypothesis, we use the F-test. The F-ratio is computed as:

The BSS portrays how large the effect of bank rate on assets, while the WSS indicates the random variation due to other uncontrolled variables. The results of F test and Granular R2 values are displayed in table 1.

Table -1: Bank Rate vs. Assets – ANOVA

S.No	Assets	F Value	Sig.	Granular Quintile-R^2
1	Cash in hand	26.762	0.000	0.56
2	Balance With RBI All Schedule Bank	9.502	0.000	0.32
3	Balances with bank	91.105	0.000	**0.72**
4	Balances In current Account	3.282	0.009	0.23
5	Balances In other Accounts	97.488	0.000	0.62
6	Other Assets	3.845	0.003	0.24
7	Investment In India	55.228	0.000	**0.71**
8	Central and State Government Securities	55.625	0.000	0.54
9	Other approved securities	127.217	0.000	0.64
10	Bank Credit	68.226	0.000	**0.74**
11	Food Credit	5.004	0.000	0.44
12	Non Food Credit	66.384	0.000	0.46
13	Loan cash credit and overdrafts	67.847	0.000	**0.78**
14	Inland Bills Purchased	32.109	0.000	0.45
15	Inland Bills Discounted	109.768	0.000	0.50
16	Foreign Bills Purchased	21.573	0.000	0.31
17	Foreign Bills Discounted	39.247	0.000	0.38
18	SLR Securities	55.228	0.000	0.49
19	commercial paper Book Value	11.308	0.000	0.10
20	Shares Public Sector undertakings Book Value	14.818	0.000	0.14
21	Shares Private Corporate Sector Book Value	19.080	0.000	0.15
22	Investments at Book Value	2.561	0.032	0.02
23	Bonds Public Sector undertakings Book Value	26.004	0.000	0.28
24	Bonds Private Corporate Sector Book Value	47.807	0.000	0.42
25	Others (Bonds) Book Value	15.132	0.000	0.13
26	Units of UTI and Other mutual funds Book Value	17.709	0.000	0.19
27	Shares Public Financial Institutions Book Value	37.950	0.000	0.30

The calculated value of F is greater than the table value of F with the degrees of freedom, and. Hence, the null hypothesis is rejected at the 95% confidence limits. We accept the alternative hypothesis. We conclude that there is a significant variation between bank rate and liquid assets. The revisions made on the bank rate influence the liquid assets values. However, we cannot conclude that the bank rate is only one factor that influences the assets before conducting post hoc multiple comparisons. R2 values are greater than 0.7 only in four cases. It implies that monthly balances with banks, investments, bank credits and cash credit loans have an immediate impact when the bank rates are revised.

In the second stage, we test the homogeneity among the clusters created for assets value based on the bank rate. We compare assets values having Granular R2 values more than 0.7. Levene's test (Levene 1960) is used to test the equal variances among the clusters. The hypotheses are established as follows;

H0 (Null hypothesis): There is no significant variation within the groups created based on the bank rate.

Ha (Alternative Hypothesis): There is significant variation within the groups created based on the bank rate

The Levene statistic test results are portrayed in table 2.

Table- 2: Test of Homogeneity of Variances on Assets

Assets	Levene Statistic	df1	df2	Sig.
Balance with banks	13.122	5	95	0.000
Investment in India	11.966	5	95	0.000
Bank credit	13.957	5	95	0.000
Loan cash credit and cash credit	14.128	5	95	0.000

As calculated value of Levene statistic is greater than the table value, we reject the null hypothesis at the 0.05 significance level. There is sufficient evidence to claim that the variances are not equal within the groups. Thus, group variances among the assets are not assumed to be equal. As group variances are not equal, the assets such as deposits in other banks, investment in India, bank credit, cash credits are highly influenced by changes in bank rates as announced by RBI.

Since equal variances are not assumed within the external factors, we move to the next stage to check the robustness of equality of means of assets value as grouped based on the bank rate. If the group variances are statistically equal, then F test is invalid. Hence, robust test of equality of means is applied. We applied the Welch and Brown-Forsythe statistics which shows the F test from an ANOVA where the response is the absolute value of the difference of each observation and the group median (Brown and Forsythe 1974). The hypotheses are formulated as follows.

H0 (Null hypothesis): The variations among the group as created based on the bank rate is not having equal variations.
H1 (Alternative hypothesis): The variations among the group as created based on the bank rate is having equal variations.

The results of Welch and Brown-Forsythe statistics are portrayed in table 3

Table 3: Robust Tests of Equality of Means on Assets

S.No	Assets	Test	Statistic	df1	df2	Sig.
1.	Balance with banks	Welch	470.617	5	32.43	0.000
		Brown-Forsythe	85.344	5	24.84	0.000
2.	Investment in India	Welch	179.127	5	33.16	0.000
		Brown-Forsythe	55.106	5	31.71	0.000
3.	Bank credit	Welch	375.028	5	28.05	0.000
		Brown-Forsythe	70.188	5	28.73	0.000
4.	Loan cash credit and cash credit	Welch	363.475	5	28.03	0.000
		Brown-Forsythe	69.521	5	28.661	0.000

Since the p value is smaller than α, we reject the null hypothesis. This implies that the variations among the groups are equal. This also supports the validity of F test. Past researchers proved that even the continuous increase or decrease in variables would result in equality of variations among different groups. We conclude that the short-term loans and investments are immediately affected by the changes in bank rate, and these are considered as sensitive assets.

The bank rate widens the ALM gap, which reflected in short-term loans and investments from

the assets side. Short-term loans of the Indian banking sector are showing increasing trend. It is growing at a CAGR of 18.1 percent, and it will be US$ 2.4 trillion by 2017. The credit growth of ICICI Bank is 141.6 per cent during financial year 2014 (Report of Emkay Global Financial Services). It is also due to credit card business which is growing at CAGR of 31.1 per cent. These assets provide a buffer in times of market freezes as banks can liquidate these holdings to meet liabilities.

6.2 Impact on Liabilities

A change in bank rate is having impact on banks' borrowing costs. This influence both lending and fixed deposit rates. The bank deposits are growing at CAGR of 21.2 per cent. Hence, we have to explore the impact of bank rate in liabilities. The variance analysis and Granular test are performed in a similar method used for assets. The results are tabulated as follows

Table 4 Bank Rate vs. Liabilities – ANOVA

S.no	Liabilities	F	Sig.	Granular Quintile-R^2
1	Demand and time deposits from bank	18.129	0.000	0.28
2	Liquid Liabilities to the Banking System	14.617	0.000	**0.71**
3	Borrowing from banks	6.059	0.000	0.26
4	Other demand and time liabilities to banking system	5.519	0.000	0.21
5	Aggregate deposits	234.192	0.000	0.56
6	Demand Deposits to Others	21.078	0.000	0.44
7	Time Deposits to Others	222.856	0.000	**0.73**
8	Borrowings (Other than from RBI, NABARD,EXIM bank)	69.643	0.000	**0.75**
9	Other demand and time liabilities to Others	31.720	0.000	0.45
10	Borrowings from RBI All Scheduled Banks	85.136	0.000	**0.71**

The results indicate that the liabilities are influenced by the bank rate. Among the liabilities, liquid liabilities, time deposits are borrowings are having direct impact. The Levene statistic test results are portrayed in table 5.

Table- 5: Test of Homogeneity of Variances - Liabilities

Liabilities	Levene Statistic	df1	df2	Sig.
Liquid Liabilities to banking system	4.735	5	95	0.001
Time deposits to others	13.340	5	95	0.000
Barrowings other than RBI	7.003	5	95	0.000
Barrowing from RBI all Scheduled banks	28.862	5	95	0.000

As group variances are not equal, the liabilities such as liquid liabilities, time deposits and borrowings are not the only one factor that influenced the bank rate. The robustness test results on liabilities are tabulated in table-6.

Table 6: Robust Tests of Equality of Means

S.No	Liabilities	Model	Statistic	df1	df2	Sig.
1.	Liquid Liabilities to banking system	Welch	14.808	5	30.355	0.00
		Brown-Forsythe	8.040	5	40.041	0.00
2.	Time deposits to others	Welch	273.815	5	34.209	0.00
		Brown-Forsythe	54.835	5	29.728	0.00
3.	Barrowings other than RBI	Welch	61.331	5	23.210	0.00
		Brown-Forsythe	44.438	5	31.738	0.00
4.	Barrowing from RBI all Scheduled banks	Welch	172.308	5	20.851	0.00
		Brown-Forsythe	23.184	5	32.502	0.00

Since the p value is smaller than α, we reject the null hypothesis. This implies that the variations among the groups are equal. This also supports the validity of F test. We conclude that liquid liabilities, time deposits and borrowings are sensitive to the bank rate. The deposits matured created a gap in ALM from the liabilities' side. The deposits maturing within one year increased to 50% from 33% within two years (2012-14). If a bank has long term deposits, then it can hold long-dated debts without costing much to bank rate risk.

6.3 Impact on Cash flows

The ALM of the bank's balance sheet is nothing but future cash inflows or outflows. (Singh & Tandon, 2012). To study the relationship between the bank rate and cash flows, we use 'F' test in the same procedure as applied for assets. We have identified thirty-four liabilities to compare with bank rate. Table -7 shows the results.

Table -7: Bank Rate vs. Cash flows – ANOVA

S.No	Cash flow	Value		Volume	
		F value	Sig.	F – value	Sig.
1	RTGS	0.552	0.783	5.089	0.003
2	Customer Transactions	1.311	0.307	5.535	0.002
3	Interbank Transactions	0.651	0.709	1.589	0.209
4	Interbank Clearing	1.758	0.166	5.343	0.003
5	CCIL Operated Systems	4.537	0.006	1.950	0.127
6	CBLO	15.979	0.000	6.740	0.001
7	Govt. Securities Clearing	4.248	0.008	2.553	0.057
8	Outright Payments	3.841	0.012	2.498	0.061
9	Repo Payments	6.173	0.001	2.972	0.034
10	Forex Clearing	1.300	0.312	1.292	0.315
11	Paper Clearing	0.871	0.550	0.657	0.704
12	Cheque Truncation System	45.387	0.000	66.627	0.000
13	MICR Clearing	35.174	0.000	40.612	0.000
14	RBI Centres clearing	55.468	0.000	44.527	0.000
15	Other Centres Clearing	9.984	0.000	20.063	0.000
16	Non-MICR Clearing	0.336	0.926	1.370	0.283
17	Retail Electronic Clearing	10.117	0.000	21.781	0.000
18	ECS DR	2.131	0.100	6.780	0.001
19	ECS CR (includes NECS)	3.199	0.026	1.866	0.143
20	EFT/NEFT	9.649	0.000	24.048	0.000

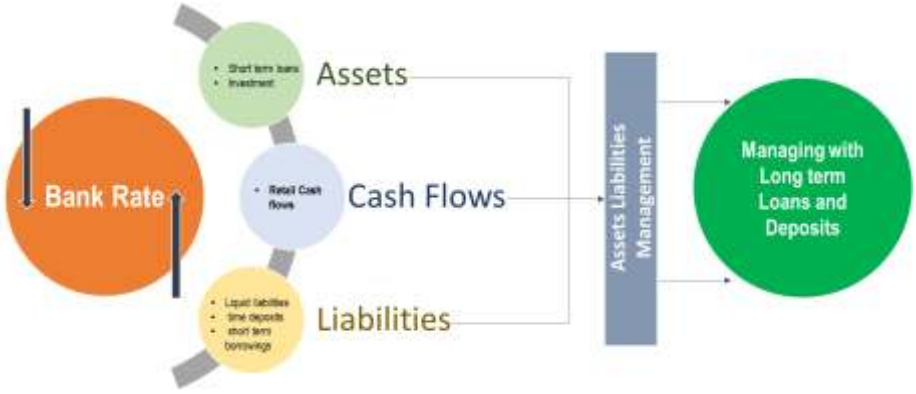
21	Immediate Payment Service (IMPS)	74.844	0.000	86.148	0.000
22	Cards Remittance	10.249	0.000	16.254	0.000
23	Credit Cards	10.934	0.000	13.696	0.000
24	Usage at ATMs	3.236	0.025	6.302	0.001
25	Usage at POS	10.939	0.000	13.716	0.000
26	Debit Cards	10.072	0.000	15.141	0.000
27	Usage at POS	4.541	0.006	8.289	0.000
28	Prepaid Payment Instruments (PPIs)	2.034	0.114	23.551	0.000
29	m-Wallet	11.847	0.000	24.493	0.000
30	PPI Cards	7.409	0.000	10.927	0.000
31	Paper Vouchers	0.626	0.728	0.927	0.512
32	Mobile Banking	65.813	0.000	25.116	0.000
33	Cards Outstanding	5.635	0.002	37.691	0.000
34	Total Remittance	1.808	0.155	12.368	0.000

We use 95% confidence limits to test the hypotheses. The result indicates that bank rate is not having impact in five variables. It includes inter-bank transactions, forex clearing, paper clearing, non MICR clearing and paper vouchers. The bank rate is not having impact in the values of six variables. It includes RTGS, customers' transactions, inter-bank clearing, ECS (Dr), pre-paid payment instruments and total remittance. Bank rate is not having any impact on the volume of four variables. It includes CCIL operations, Government securities clearing; out-right payments and ECS (Cr). The revision in bank rates will have an impact on the remaining nineteen variables. We have grouped those variables and named as 'retail cash flows'.

7. FINDINGS AND IMPLICATIONS

The findings of the research clearly indicates that the revisions made in bank rate will have a direct impact is having impact on ALM variables. Short-term loans, short investments, liquid liabilities, time deposits, short-term borrowing and retail cash flows are influenced by changes in bank rates. The remittance system in values is not influenced by the bank rate; whereas remittance in volume is affected by changes in bank rate. Exhibit-2 shows the results.

Exhibit -2: ALM Risk Exposure



Funding the long-term assets with short-term funds is attracting the interest rate exposure. However, long-term assets and liabilities are not directly influenced by the bank rate. Hence, ALM gap can be reduced by cash flows from long-term loans and deposits.

8. CONCLUSION

The volatility in the bank rate is having an effect on the volume of cash flows but not on the value of cash flows. Hence, we conclude that if the costs of cash outflows increases in proportion with bank rates, the ALM gap can be decreased during the period of the liquidity squeeze. On the other hand, managing with long-term loans with deposits decreases the bank rates exposure.

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