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Influence of Monetary Policy on the Profitability of the Commercial Bank– An Analytical Study of the State Bank of India

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ABSTRACT: This paper seeks to analyse the effect of monetary policy instruments on the bank's revenue and profitability of the India's largest public bank "State Bank of India". The Independent Variables (IV) used for monetary policy instruments are Bank Rate (BR), Repo Rate (RR), Reverse Repo Rate (RRR), Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Margin of Standing Facility (MSF). The dependent variables (DV) are Interest income on Discount on Advances/Bills, Income on Investment, Interest on Balances with RBI, Operating Profit before provisions and Contingencies, Net Profit/ loss for the period. The data is collected for the period from Dec. 2007 to Dec. 2009; in total 45 quarters are analysed. In order to overcome the challenges of the extent and magnitude of the impact of monetary policy on the profitability of State Bank of India, we further performed a Multi–Variate Analysis technique, representing multiple independent variables (IV) and multiple dependent variables (DV), are used them to generate Vector Auto-Regression Model. In order to investigate the interdependency of lag values between independent and dependent variables, the impulse response function was analysed to check the shock and innovation of monetary policy changes on the profitability. Granger causality test is used to check the causality between the independent to dependent variables. Econometric tools namely Augmented Dickey Fuller test and multivariate technique i.e. Vector Auto Regression (VAR) model was used to check the stationarity of the data. In order to investigate the interdependency of lag values between independent and dependent variables, the impulse response function was analysed to check the shock and innovation of monetary policy changes on the profitability. Granger causality test was used to check the causality between the independent and dependent variables.

Overall, we find a positive relationship between all the monetary policy variables tested with an impact on operational performance. However, none of the variables directly influenced the Net profit of the bank. Hence, it is concluded that except monetary policy variables other factors influencing net profitability may be such as adjustments of provisions and contingencies before realization of the net profit. Further, it is found that Income on Discount and Advances and Bills cause CRR, whereas Repo Rate and Reverse repo rate cause Income on Discount, Advances and Bills and Income on Investment Cause SLR: on the other hand CRR and Repo rate cause unidirectional effect on Income on Interest on balances with RBI, whereas in rest of the variables either of the direction of causality could not be ascertained.

Keywords: CRR, Granger Causality, Monetary Policy, Profitability, Repo, Reverse Repo Rate, SLR, VAR, How to work with this template.

I. INTRODUCTION

The banking sector plays a key role in supply of funds for the smooth functioning of the corporate sector and thereby enhancing the prospects of a better economy. Similarly, the RBI uses effectively its quantitative tools of monetary policy to control the money supply. The monetary policy tools that are used are Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) in order to constructively regulate the banking system. The monetary policy changes will create a significant impact on the performance of the commercial banks. Understanding the link between Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) in order to constructively regulate the banking system and bank profitability is important for proper understanding and evaluating the effect of the monetary policy stance – which will directly or indirectly influence the interest rate structure, on the contrary, monetary policy is not, of course, the only influence on the interest rate structure, it has a major impact on it.

The banking performance, in terms of profitability, is measured through the supply of funds generated on one side and the demand for the funds, in the economy, on the other side. At the point of intersection of demand and supply, the equilibrium is attained and the interest rate is determined; the misbalancing of funds cause inflation in the economy and surprisingly, the link between monetary policy and bank profitability is an under-researched area, only few studies have focused specifically on the impact of interest rates on bank profitability.

Thus, the central bank uses the monetary policy tools to regulate the circulation of currency in the banking system to ensure the profitability.

In the present study, we explore the link between monetary variables at various levels of profitability of the State Bank of India, which is an Indian multinational, public sector banking and financial services statutory body.

We contribute to the literature to study the impact of monetary policy on the performance of the banking sector and to analyse the impact of monetary policy variables - Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) on the profitability variables i.e. Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies and Net Profit of the State Bank of India. The analysis yields four hypothesis (H01-H04) and each one is covered extensively with empirical analysis and the outcome is discussed.

II. REVIEW OF LITERATURE

It is a known fact that a number of research studies were conducted about the impact of monetary policy on the performance of the banking sector. Though, tremendous amount of research was executed to study the effect of business conditions on a bank's profitability, in the process, a noteworthy result was established with a direct link between monetary policy and bank's profitability; the net result being an under research in the area of monetary policy and its effect on bank's profitability. There is a close proximity and near unanimity in the literature suggesting that there exists a strong positive effect of monetary policy on the bank's profitability. In the present review of literature a few relevant studies are presented and quoted:

Goodfriend (1987) [1] argued that a course of action termed as "Tight Monetary Policy" might lead to a riskier bank behavior. The advantage of following an aggressive monetary policy may perhaps induce a beneficiary bank to make significant gains in funding cost. Similar argument was put forth by Smith and Egteren (2005) [2]. It causes a distortion in competition that may snowball into undertaking risk bearing projects.

Demirgüç-Kunt and Huizinga (1999) [3] examined the relationship between bank profitability and real interest rates. It was observed that banks yield higher profitability with a rise in interest margins. This is quite true in developing countries, where the demand liabilities are often quoted below the market interest rates.

Driffill *et al*., (2006) [5] highlighted, that the widely followed economic term smoothing interest rate process might result in moral hazard in a bid to promote financial stability. The vagueness and uncertainty involved in the process of interest rate smoothing can often lead to serious and undesirable repercussions.

Granville and Mallick (2009) [6] conducted a study on the member states of Economic and Monetary Union (EMU) for the period from 1994–2008 in which they observed that the relationship between financial stability and monetary stability is positively correlated.

Younus and Akhtar (2009) [7] conducted a study on the effects of reserve ratio on the banks credibility in Bangladesh. The reserve ratios, Statutory Liquidity Ratio (SLR) and Cash Reserve Ratios (CRR) along with bank rates were used. The descriptive analysis suggested that SLR had a negative impact on the bank credit before 1990s. Though it was concluded that the bank rate, CRR and SLR were effective in controlling inflation but Bangladesh often relied on open market operations because of its market oriented approach.

Dovern *et al*., (2010) [8] examined the interaction between the banking sector and the macroeconomic factors by using VAR model. In order to determine the banking sector stress, the proxies namely return on equity and loan write offs were used. It was found that the responses of monetary policy have a direct bearing on the level of stress in the banking sector.

Omankhanlen (2014) [11] examined the effect of monetary policy on the bank's profitability, he examined the influence of the dependent variable i.e., total loans and advances on the two independent variables namely monetary policy rate and the average exchange rate. The results conclude that there exists a significant and positive effect on commercial banks' loans and advances during the 30 year period of study.

Udeh (2015) [12] examined as to how the monetary policy instruments impacted the profitability of commercial Banks in Nigeria. This study revealed that the Cash Reserve Ratio, Lending Rate and Interest Rate did not have a significant effect on the profitability of Zenith Bank Plc. However, the minimum rediscount rate had a significant influence on the profit before tax. He emphasized that an appropriate mechanism should be worked out so as to supplement the effects of monetary policy instruments in order to improve the profits of commercial banks in Nigeria.

Ekpung *et al*., (2015) [13] conducted a study on the effect of Monetary Policy and the performance of banking sector for a period from 1970 to 2006. The study uses bank deposit liabilities as a proxy to represent banks' performance. Their findings suggest that the study shows a significant effect of monetary policy on banks' performance. The other two variables namely deposit rate and minimum discount rate have a negative influence on the banks' deposit liabilities. The exchange rate has a positive and significant effect on banks' performance.

Nguyen *et al*., (2017) conducted a study on twenty commercial banks in Vietnam for the period from 2007 to 2014. The proxies of monetary policy used are monetary base (MB), discount rate (DIS) and required reserve ratio (RRR). The results show a positive bearing of these ratios on profit before tax of the 20 sample banks functioning in Vietnam. Among the three monetary policy proxies MB i.e. Monetary Base is known to have a significant and positive effect on the bank's profit. The results concluded that monetary base rate to be the essential element in the monetary policy followed in Vietnam [14].

Borio*et al*., (2017) investigated 109 large banks for the period from 1995 to 2012. The effect of a positive relationship was observed between short term rates and the slope of the yield curve. Similarly, a favorable effect was noticed between the short term rate and return on assets. The return on asset was a proxy variable to measure the profitability of the banks. It also observed that there exists a strong positive effect of the interest rate structure on the net interest income and dominated the negative effect shown in loan loss provision on non-interest income. It is clear that the effect is stronger on the yield curve as it is less steep due to lower level of interest rates. These factors indicate that the lower level of interest rates and flat term structure gradually reduces the profitability of banks.

Nguyen *et al*., (2019) [16] used Vector Auto-Regression model on a monthly data, to measure the effects of monetary policy on the Vietnamese Economy.

Post January 1998, after the introduction of the Law on Central Bank, the country Vietnam, gradually introduced the national monetary policy and directed its efforts in achievement of its objectives in line with international standards and procedures. There is evidence that the monetary policy plays an effective role in stabilizing prices. It was found that credit growth tends to induce inflationary pressure causing expansion in money supply leading to increase in industrial production.

Banu and Vepa (2018) [17] conducted a study on the impact of Non-Performing Assets on the profitability of banking sector, results revealed that there exists an imperative inverse relationship between the non-performing asset and the return on asset and return on equity across all banking sectors. It is found that a proper and continuous system of monitoring needs to be evolved to evaluate the credit worthiness of the borrower. It is also noted that post-sanctioning follows up and ensured end use are the measures to name a few, to curb the non-performing assets.

The need for the study: Though, tremendous research has been carried out the effect of monetary policy impact on bank's profitability, a noteworthy result was established with a direct link between monetary policy and bank's profitability but no uniform study was found which analyzed all the monetary policy variable like SLR,CRR, Repo Rate, Reverse Repo Rate, Marginal Standing Facility on various components of revenue and profitability of banking performance, as Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions, Contingencies and Net Profit. Hence it creates curiosity to study impact of monetary policy of banking profitability by select a public sector bank.

III. OBJECTIVES

To analyse the impact of monetary policy variables like Bank Rate (BR), Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate (RR), Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF)on the revenue and profitability, Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies and Net Profit of the State Bank of India.

IV. HYPOTHESIS

H01: To analyze impact of monetary policy variables Bank Rate (BR), Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate (RR), Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) on the banks revenue and profitability, Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies and Net Profit of the banks a study of the select public sector bank was carried.

H02: There is no correlation between profitability of bank and monetary policy variables.

H03: There are no auto regression vectors between profitability of bank and monetary policy variables.

H04: There is no significance impact of all monetary variables together at different levels of profitability of the bank.

V. RESEARCH METHODOLOGY AND DATA COLLECTION

The present research is conducted a case study by using a public sector bank (State Bank of India). To fulfil the objective of the study uses the dependent variables are Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies and Net Profit, whereas influencing variables are Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF).

The study is analytical in nature data was collected from Reserve bank of India and SBI official websites Quarterly Time Series Data for the period from Dec, 2007 to Dec 2018 (totalling 45 quarters) along with the other published sources of Select bank annual reports, research articles and books.

VI. METHODOLOGY USED FOR ANALYSIS

The analysis done through the econometric models, it is prerequisite to check the stationarity of time series data for using any time series model, hence stationarity test done through Augmented Dickey Fuller test, then multivariate technique vector auto regression (VAR) model uses to investigate the relationship and impact of independent variable on dependent variables, the impulse response function was analysed to check the shock and innovation of monetary policy changes on the revenue and profitability. The Granger causality test was used to check the causality between the independent and dependent variables.

The Vector Auto Regression (VAR) model equations are as follows:

*Income on Discount, Advances and Bills = C(1,1)*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + C(1,2)*INCOME ON INVESTMENT(-1) + C(1,3)* INT. ON BALANCES WITH RBI(-1) + C(1,4)*OPBPC(-1) + C(1,5)*NET PROFIT(-1) + C(1,6)*BR(-1) + C(1,7)*CRR(-1) + C(1,8)*SLR(-1) + C(1,9)*RR(-1) + C(1,10)*RRR(-1) + C(1,11)*MSF(-1) + C(1,12).*

*INCOME ON INVESTMENT = C(2,1)*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + C(2,2)*INCOME ON INVESTMENT(-1) + C(2,3)* INT. ON BALANCES WITH RBI(-1) + C(2,4)*OPBPC(-1) + C(2,5)*NET PROFIT(-1) + C(2,6)*BR(-1) + C(2,7)*CRR(-1) + C(2,8)*SLR(-1) + C(2,9)*RR(-1) + C(2,10)*RRR(-1) + C(2,11)*MSF(-1) + C(2,12).*

*INT. ON BALANCES WITH RBI = C(3,1)*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + C(3,2)*INCOME ON INVESTMENT(-1) + C(3,3)* INT. ON BALANCES WITH RBI(-1) + C(3,4)*OPBPC(-1) + C(3,5)*NET PROFIT(-1) + C(3,6)*BR(-1) + C(3,7)*CRR(-1) + C(3,8)*SLR(-1) + C(3,9)*RR(-1) + C(3,10)*RRR(-1) + C(3,11)*MSF(-1) + C(3,12).*

*OPBPC = C(4,1)*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + C(4,2)*INCOME ON INVESTMENT(-1) + C(4,3)* INT. ON BALANCES WITH RBI(-1) + C(4,4)*OPBPC(-1) + C(4,5)*NET PROFIT(-1) + C(4,6)*BR(-1) + C(4,7)*CRR(-1) + C(4,8)*SLR(-1) + C(4,9)*RR(-1) + C(4,10)*RRR(-1) + C(4,11)*MSF(-1) + C(4,12).*

*NET PROFIT = C(5,1)*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + C(5,2)*INCOME ON INVESTMENT(-1) + C(5,3)* INT. ON BALANCES WITH RBI(-1) + C(5,4)*OPBPC(-1) + C(5,5)*NET PROFIT(-1) + C(5,6)*BR(-1) + C(5,7)*CRR(-1) + C(5,8)*SLR(-1) + C(5,9)*RR(-1) + C(5,10)*RRR(-1) + C(5,11)*MSF(-1) + C(5,12).*

VAR Model - Substituted Coefficients:

*INCOME ON DISCOUNT, ADVANCES AND BILLS = 0.807994004132*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + 0.47227093452*INCOME ON INVESTMENT(-1) - 1.71177223203* INT. ON BALANCES WITH RBI(-1) + 0.0754809208369*OPBPC(-1) - 0.131847895329*NET PROFIT(-1) + 280.29825824*BR(-1) + 22.0961890264*CRR(-1) + 900.486195284*SLR(-1) - 5.95308491831*RR(-1) + 118.140359318*RRR(-1) + 136.683516739*MSF(-1) - 22649.8753818.*

*INCOME ON INVESTMENT = 0.0806674093403*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + 0.82657668524*INCOME ON INVESTMENT(-1) + 0.31988058512* INT. ON BALANCES WITH RBI(-1) - 0.0426733714469*OPBPC(-1) - 0.00104071475097*NET PROFIT(-1) + 109.708931737*BR(-1) + 547.67752166*CRR(-1) - 315.806732283*SLR(-1) - 729.667494495*RR(-1) + 410.010805401*RRR(-1) + 39.705545952*MSF(-1) + 6328.12836743.*

*INT. ON BALANCES WITH RBI = 0.00366659328354*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) - 0.0469076611459*INCOME ON INVESTMENT(-1) + 0.62820794011* INT. ON BALANCES WITH RBI(-1) + 0.0100334420805*OPBPC(-1) + 0.00345793713881*NET PROFIT(-1) - 48.2978549844*BR(-1) - 113.146800044*CRR(-1) - 111.614414249*SLR(-1) + 121.258039979*RR(-1) - 7.23250241061*RRR(-1) - 41.2277560613*MSF(-1) + 3294.81271512.*

*OPBPC = 0.450405554971*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + 0.0103001502793*INCOME ON INVESTMENT(-1) - 1.05084552091* INT. ON BALANCES WITH RBI(-1) - 0.0521725546404*OPBPC(-1) + 0.079920661189*NET PROFIT(-1) - 950.090326691*BR(-1) + 256.858877637*CRR(-1) - 43.9188270447*SLR(-1) - 439.406803762*RR(-1) + 317.403369634*RRR(-1) - 7.84736987783*MSF(-1) + 5811.70859872.*

*NET PROFIT = 0.167098308422*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + 0.024298494451*INCOME ON INVESTMENT(-1) + 1.95115749487* INT. ON BALANCES WITH RBI(-1) - 0.0733345679614*OPBPC(-1) + 0.0765817900744*NET PROFIT(-1) - 241.736936432*BR(-1) - 1179.11358942*CRR(-1) + 1681.4515038*SLR(-1) + 1305.25837403*RR(-1) + 98.0301069434*RRR(-1) - 215.535669989*MSF(-1) - 41971.8384302.*

*INCOME ON DISCOUNT, ADVANCES AND BILLS = C(1)*INCOME ON DISCOUNT, ADVANCES AND BILLS (-1) + C(2)*INCOME ON INVESTMENT(-1) + C(3)* INT. ON BALANCES WITH RBI(-1) + C(4)*OPBPC(-1) + C(5)*NET PROFIT(-1) + C(6)*BR(-1) + C(7)*CRR(-1) + C(8)*SLR(-1) + C(9)*RR(-1) + C(10)*RRR(-1) + C(11)*MSF(-1) + C(12)*

VII. DATA ANALYSIS AND DISCUSSIONS

The analysis of stationarity, VAR, Impulse Response function and Granger causality of time series Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies, Net Profit, the Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) presented.

Table 1 presents the stationarity analysis of Income on Discount, Advances and Bills, income on Investments, income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies and Net Profit as dependent variables. Whereas the Bank Rate (BR), Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate (RR), Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) are independent variables. It is pre requisite to check the stationarity of the time series before finding the economic relation between the variables.

It is observed that all the dependent and independent variables of the study are non- stationary at I (0) order that the null hypothesis rejects at critical values of t test results at 5% significance level with associated probabilities, whereas income on Interest on balances with RBI and Net Profit at I (0) order level only attains the stationarity. After first difference order level I (1) all the parameters attained the stationarity at 5% level of significance. it possible to investigate the existence of long term economic relation as well as significant dynamics among the series.

The correlation analysis between revenue, profitability and monetary variables Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies, Net Profit, on the Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) are presented through Table 2.

Table 1: Analysis of stationarity of banking profitability variables and monetary variables (Augmented Dickey Fuller Unit Root Test).

Series	Unit Root Results				
I(0) level	ADF (T stat)	PROB	I(1) level	ADF (T stat)	PROB
RR	-2.460371	0.1321	D(RR)	-4.633327	0.0005
RRR	-2.252022	0.1918	D(RRR)	-3.558187	0.0109
CRR	-2.223535	0.2011	D(CRR)	-6.341521	0.0000
BR	-1.731214	0.4089	D(BR)	-7.525684	0.0000
SLR	-0.112114	0.9416	D(SLR)	-6.813361	0.0000
MSF	-1.576876	0.4857	D(MSF)	-6.004548	0.0000
Income on discount, advances and bills	-1.312859	0.6154	D(INCOME ON DISCOUNT, ADVANCES AND BILLS)	-2.747422	0.0447
Income on investment	1.427455	0.9988	D(INCOME ON INVESTMENT)	-6.705261	0.0000
Int. on balances with RBI	-2.948687	0.0479	D(INT. ON BALANCES WITH RBI)	-6.143366	0.0000
OPBPC	-1.374272	0.5854	D(OPBPC)	-3.553726	0.0119
Net profit	-3.059967	0.0371	D(NET PROFIT)	-5.993449	0.0000

H01: There is Unit root exists in Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies, Net Profit, the Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF).

Table 2: Analysis of Correlation between Revenue, Profitability variables and monetary variables.

		Income on discount, advances and bills	Income on investment	Int. on balances with RBI	OPBPC	Net profit
BR	Pearson Correlation	0.518**	0.160	-0.162	0.263	0.400**
	Sig. (2-tailed)	0.000	0.293	0.288	0.080	0.006
	N	45	45	45	45	45
RR	Pearson Correlation	0.190	-0.090	-0.407**	0.030	0.337*
	Sig. (2-tailed)	0.212	0.554	0.006	0.846	0.024
	N	45	45	45	45	45
RRR	Pearson Correlation	0.552**	0.308*	-0.297*	0.413**	0.163
	Sig. (2-tailed)	0.000	0.040	0.047	0.005	0.285
	N	45	45	45	45	45
MSF	Pearson Correlation	0.832**	0.572**	-0.040	0.655**	0.103
	Sig. (2-tailed)	0.000	0.000	0.796	0.000	0.499
	N	45	45	45	45	45
CRR	Pearson Correlation	-0.834**	-0.717**	-0.261	-0.718**	0.073
	Sig. (2-tailed)	0.000	0.000	0.083	0.000	0.632
	N	45	45	45	45	45
SLR	Pearson Correlation	-.873**	-.982**	-0.285	-0.880**	0.461**
	Sig. (2-tailed)	0.000	0.000	0.058	0.000	0.001
	N	45	45	45	45	45

** Correlation of coefficient is significant at 0.01 level (two tail test).
* Correlation of coefficient is significant at 0.05 level (two tail test)Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies, Net Profit, the Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF)
H02: There is no correlation between revenue, profitability of bank and monetary policy variables.

It is evident that Bank rate has shown the significant positive correlation on Income on Discount, Advances and Bills and Net Profit. The Repo Rate (RR) signifies Income on Interest on balances with RBI and Net Profit, whereas the Reverse Repo Rate signifies

association on Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies except Net Profit. The Marginal Standing Facility (MSF) resulted in significantly high positive correlation on Income on Discount, Advances and Bills, Income on Investments and Operating Profit. On the other hand, CRR found the significant negative impact on Income on Discount, Advances and Bills, Income on Investments, Operating Profit before Provisions and Contingencies, at a similar pace. The Statutory Liquidity Ratio(SLR)also found the same impact on Net Profit.

Table 3: Vector Auto Regression (VAR) analysis of monetary policy and the Revenue, Profitability of the bank.

	Income on discount, advances and bills	Income on investment	Int. on balances with RBI	OPBPC	Net profit
BR(-1)	-170.5180	423.1888	127.7331	145.3852	-632.9640
	(256.843)	(164.270)	(45.1664)	(389.921)	(717.239)
	[-0.66390]	[2.57618]	[2.82805]	[0.37286]	[-0.88250]
BR(-2)	-325.7430	-23.05060	2.685575	-347.1207	679.2042
	(284.472)	(181.941)	(50.0251)	(431.865)	(794.394)
	[-1.14508]	[-0.12669]	[0.05368]	[-0.80377]	[0.85500]
BR(-3)	-1337.660	-21.22788	29.28644	563.8032	-460.6245
	(370.562)	(237.002)	(65.1643)	(562.562)	(1034.80)
	[-3.60981]	[-0.08957]	[0.44942]	[1.00221]	[-0.44513]
CRR(-1)	-2955.802	388.7233	28.45663	3650.666	-450.5755
	(722.469)	(462.072)	(127.048)	(1096.80)	(2017.51)
	[-4.09125]	[0.84126]	[0.22398]	[3.32846]	[-0.22333]
CRR(-2)	2317.397	365.8559	191.6620	1004.844	-4547.790
	(916.917)	(586.436)	(161.242)	(1392.00)	(2560.51)
	[2.52738]	[0.62386]	[1.18866]	[0.72187]	[-1.77612]
CRR(-3)	-3246.042	796.0462	400.0459	2848.386	43.98294
	(755.040)	(482.904)	(132.776)	(1146.25)	(2108.47)
	[-4.29916]	[1.64846]	[3.01294]	[2.48496]	[0.02086]
SLR(-1)	2690.215	-6.905388	-77.86545	-1203.909	1776.025
	(677.806)	(433.507)	(119.194)	(1029.00)	(1892.79)
	[3.96901]	[-0.01593]	[-0.65327]	[-1.16998]	[0.93831]
SLR(-2)	944.1797	-264.3959	-20.45714	-2138.150	-1423.950
	(578.656)	(370.093)	(101.758)	(878.476)	(1615.91)

	[1.63168]	[-0.71440]	[-0.20104]	[-2.43393]	[-0.88121]
SLR(-3)	1040.305	-16.24643	-108.1747	114.7249	-693.0885
	(443.510)	(283.657)	(77.9923)	(673.306)	(1238.51)
	[2.34562]	[-0.05727]	[-1.38699]	[0.17039]	[-0.55961]
RR(-1)	2377.129	-377.0436	-163.9788	-4433.740	1945.437
	(969.321)	(619.952)	(170.458)	(1471.56)	(2706.85)
	[2.45237]	[-0.60818]	[-0.96199]	[-3.01296]	[0.71871]
RR(-2)	-4328.616	-55.22288	108.8499	311.2196	5996.715
	(1304.92)	(834.593)	(229.474)	(1981.04)	(3644.02)
	[-3.31715]	[-0.06617]	[0.47435]	[0.15710]	[1.64563]
RR(-3)	4588.012	-1129.504	-687.5223	-4863.073	1392.164
	(1025.23)	(655.709)	(180.289)	(1556.43)	(2862.98)
	[4.47511]	[-1.72257]	[-3.81344]	[-3.12450]	[0.48626]
RRR(-1)	1022.375	-180.0035	-20.70782	1061.428	-830.4530
	(808.511)	(517.102)	(142.179)	(1227.43)	(2257.79)
	[1.26452]	[-0.34810]	[-0.14565]	[0.86476]	[-0.36782]
RRR(-2)	1713.166	479.3811	-200.2708	798.6481	-1934.582
	(1144.76)	(732.157)	(201.309)	(1737.89)	(3196.77)
	[1.49653]	[0.65475]	[-0.99484]	[0.45955]	[-0.60517]
RRR(-3)	-718.8283	168.6188	491.7369	999.5364	-3820.537
	(895.697)	(572.864)	(157.511)	(1359.79)	(2501.26)
	[-0.80254]	[0.29434]	[3.12193]	[0.73507]	[-1.52745]
MSF(-1)	-178.2797	116.8085	-3.649373	457.6927	33.11779
	(137.299)	(87.8126)	(24.1443)	(208.437)	(383.410)
	[-1.29848]	[1.33020]	[-0.15115]	[2.19583]	[0.08638]
MSF(-2)	-71.38086	99.37857	43.92902	300.9461	-486.1537
	(134.986)	(86.3335)	(23.7377)	(204.927)	(376.952)
	[-0.52880]	[1.15110]	[1.85060]	[1.46856]	[-1.28970]
MSF(-3)	-611.9695	-60.13881	7.023608	586.3719	286.0799
	(143.191)	(91.5809)	(25.1804)	(217.382)	(399.863)
	[-4.27381]	[-0.65667]	[0.27893]	[2.69743]	[0.71544]
C	-106252.8	2504.252	3725.464	76382.91	24871.89
	(27348.0)	(17491.0)	(4809.21)	(41517.8)	(76369.9)
	[-3.88522]	[0.14317]	[0.77465]	[1.83976]	[0.32568]
R-squared	0.999284	0.999073	0.974078	0.989585	0.943382
Adj. R-squared	0.996333	0.995247	0.867150	0.946625	0.709833
Sum sq. resids	2091159.	855397.9	64667.29	4819542.	16307265
S.E. equation	511.2679	326.9935	89.90780	776.1719	1427.728
F-statistic	338.5535	261.1662	9.109675	23.03482	4.039335
Log likelihood	-286.7222	-267.9501	-213.7216	-304.2563	-329.8539
Akaike AIC	15.27248	14.37858	11.79627	16.10744	17.32638
Schwarz SC	16.67917	15.78526	13.20295	17.51413	18.73306
Mean dependent	31473.45	11780.81	369.8352	11195.38	2587.466
S.D. dependent	8442.724	4743.120	246.6703	3359.609	2650.463
Determinant resid covariance (dof adj.)		0.000000			
Determinant resid covariance		0.000000			

Standard errors in ( ) & t-statistics in [ ], (AIC Information Criterion) lag3

Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies, Net Profit, the Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF)
H03: There is no auto regression vector exists between the Revenue, Profitability of bank and monetary policy variables.

Table 3 presents the VAR estimation of profitability variable of the bank and monetary variables. The monetary variables - Bank Rate (BR), Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate (RR), Reverse Repo Rate (RRR), and Marginal Standing Facility (MSF) are used as independent variables and Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies, Net Profit are dependent variables. It is observed from the analysis that BR first lag BR(-1) influenced Income on Investments, Income on Interest on balances with RBI and lag BR(-3) influences Income on Discount, Advances and Bills, the Cash Reserve Ratio influenced Income on Discount, Advances and Bills, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies at lag of 1 to 3. Whereas lag of Statutory Liquidity Ratio

(SLR (-1,-2 &-3) have influenced Income on Discount, Advances and Bills Operating Profit before Provisions and Contingencies, the lags of Repo Rate influenced Income on Discount, Advances and Bills, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies, the lag of Reverse Repo rate (RRR -3) influenced only Income on Interest on balances with RBI, the other hand lag of Marginal Standing Facility (MSF-3) influenced only Operating Profit before Provisions and Contingencies. It is found that the all monetary policy variables shown impact on operational performance but none of the variables directly influenced the Net profit of the bank, drawing the conclusion that except monetary policy variable other factors influencing net profitability may be such as adjustment of provisions and contingencies before realisation of the net profit.

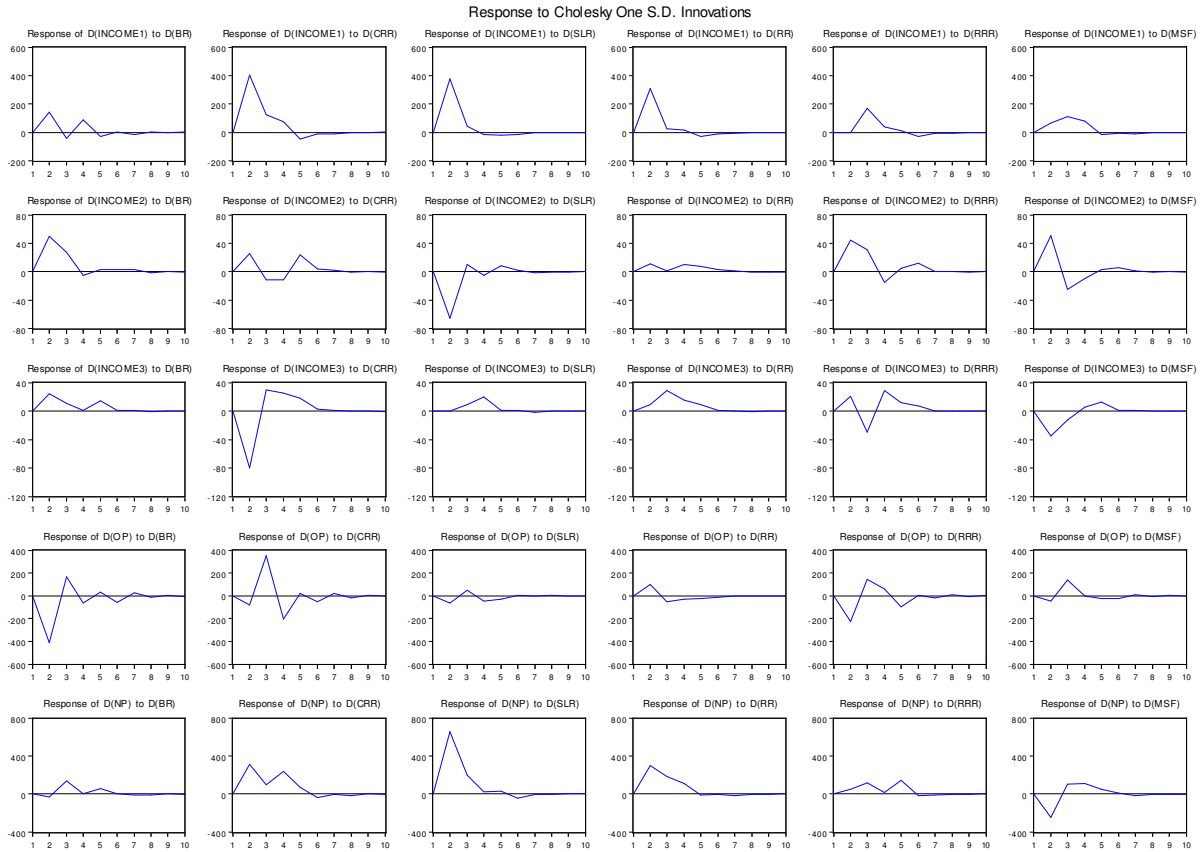

Fig. 1. The Impulse Response function of monetary variables on revenue and profitability of bank.

Bank Rate (BR) Cash Reserve Ratio (CRR) Statutory Liquidity Ratio (SLR) Repo Rate (RR) Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) are independent variables and Income on Discount, Advances and Bills(Income1), Income on Investments(Income2), Income on Interest on balances with RBI(Income3), Operating Profit before Provisions and Contingencies, Net Profit are dependent variables.

The impulse response function presented the shock and innovation influence on dependent variables and its response to change in the policies. The Fig. 1 presents changes in the monetary policy variables for the period of the study by using the Cholesky test with lag values of independent variables and brought the consolidation through the policy shocks. The horizontal graph presents response of each dependent variable on independent variables and vertical graph presents response of each independent variable on dependent variable. It is clearly observed that Income on Discount, Advances and Bills positively respond to shock or innovations or changes in all monetary policy variable Bank Rate (BR), Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate (RR), Reverse Repo Rate (RRR) and Marginal Standing Facility (MSF) at their lag values of three to four lags then met the convergence. Whereas income on investments found very volatile responses at all levels of the lags of all independent variables except Reverse Repo rate, the Income on Interest on balances with RBI respond to Bank rate, SLR, Repo rate and Reverse repo rate.

On the other hand, operating profit influenced by every shock in the monetary policy variable received mixed response both positive as well as negative except the Reverse repo rate. The net profit found respond to shocks in SLR, CRR and RR positively and negatively to MSF.

Table 4 clearly points out that the all monetary variables jointly influenced the profitability of the bank at various levels of Income on Discount, Advances and Bills, Income on Investments, Income on Interest on balances with RBI, Operating Profit before Provisions and Contingencies and Net Profit. It is found that Income on Discount, Advances and Bills and Operating Profit before Provisions and Contingencies were impacted by all monetary policy variables taken together, whereas there was no significant change in other dependent variables -Income on Investments, Income on Interest on balances with RBI and Net Profit.

Table 4: Analysis of impact on all monetary variables together at different levels of profitability of the bank (Wald test statistics).

	Chi-square	df	Probability
Income on discount, advances and bills	23.62162	7	0.0013
Income on investment	9.406992	7	0.2247
Int. on balances with RBI	6.023851	7	0.5370
OPBPC	20.46857	7	0.0046
Net profit	5.933547	7	0.5475

H04: there is no significant impact of all monetary policy variables taken together at different levels of profitability of the bank.

Table 5: Causality Analysis between monetary variables and profitability of the bank (Granger Causality Tests).

Null Hypothesis:	Obs	F-Statistic	Prob.	Direction of Causality
BR does not Granger Cause INCOME ON DISCOUNT, ADVANCES AND BILLS	43	0.27703	0.7595	No causality
INCOME ON DISCOUNT, ADVANCES AND BILLS does not Granger Cause BR		0.81440	0.4505	
CRR does not Granger Cause INCOME ON DISCOUNT, ADVANCES AND BILLS	43	2.48627	0.0967	
INCOME ON DISCOUNT, ADVANCES AND BILLS does not Granger Cause CRR		4.10193	0.0244	Unidirectional
SLR does not Granger Cause INCOME ON DISCOUNT, ADVANCES AND BILLS	43	1.40297	0.2583	No causality
INCOME ON DISCOUNT, ADVANCES AND BILLS does not Granger Cause SLR		1.35847	0.2693	
RR does not Granger Cause INCOME ON DISCOUNT, ADVANCES AND BILLS	43	7.13270	0.0023	Unidirectional
INCOME ON DISCOUNT, ADVANCES AND BILLS does not Granger Cause RR		0.10965	0.8964	
RRR does not Granger Cause INCOME ON DISCOUNT, ADVANCES AND BILLS	43	6.47216	0.0038	Unidirectional
INCOME ON DISCOUNT, ADVANCES AND BILLS does not Granger Cause RRR		0.78182	0.4648	
MSF does not Granger Cause INCOME ON DISCOUNT, ADVANCES AND BILLS	43	1.35796	0.2694	No causality
INCOME ON DISCOUNT, ADVANCES AND BILLS does not Granger Cause MSF		0.40202	0.6718	
BR does not Granger Cause INCOME ON INVESTMENT	43	0.12745	0.8807	No causality
INCOME ON INVESTMENT does not Granger Cause BR		0.14421	0.8662	
CRR does not Granger Cause INCOME ON INVESTMENT	43	0.17570	0.8395	No causality
INCOME ON INVESTMENT does not Granger Cause CRR		1.25808	0.2958	
SLR does not Granger Cause INCOME ON INVESTMENT	43	1.09603	0.3445	
INCOME ON INVESTMENT does not Granger Cause SLR		7.45237	0.0019	Unidirectional
RR does not Granger Cause INCOME ON INVESTMENT	43	0.33112	0.7202	No causality
INCOME ON INVESTMENT does not Granger Cause RR		0.11768	0.8893	
RRR does not Granger Cause INCOME ON INVESTMENT	43	0.54552	0.5840	No causality
INCOME ON INVESTMENT does not Granger Cause RRR		0.34085	0.7133	
MSF does not Granger Cause INCOME ON INVESTMENT	43	0.45583	0.6373	No causality
INCOME ON INVESTMENT does not Granger Cause MSF		0.08184	0.9216	
BR does not Granger Cause INT. ON BALANCES WITH RBI	43	0.47136	0.6278	No causality
INT. ON BALANCES WITH RBI does not Granger Cause BR		0.72034	0.4931	
CRR does not Granger Cause INT. ON BALANCES WITH RBI	43	7.66640	0.0016	Unidirectional
INT. ON BALANCES WITH RBI does not Granger Cause CRR		0.03310	0.9675	
SLR does not Granger Cause INT. ON BALANCES WITH RBI	43	1.53971	0.2275	No causality
INT. ON BALANCES WITH RBI does not Granger Cause SLR		0.40028	0.6729	
RR does not Granger Cause INT. ON BALANCES WITH RBI	43	3.82938	0.0305	Unidirectional
INT. ON BALANCES WITH RBI does not Granger Cause RR		0.89501	0.4170	
RRR does not Granger Cause INT. ON BALANCES WITH RBI	43	0.70246	0.5017	No causality
INT. ON BALANCES WITH RBI does not Granger Cause RRR		0.35392	0.7042	
MSF does not Granger Cause INT. ON BALANCES WITH RBI	43	0.36445	0.6970	No causality
INT. ON BALANCES WITH RBI does not Granger Cause MSF		0.58614	0.5614	

BR does not Granger Cause OPBPC	43	0.81656	0.4496	No causality
OPBPC does not Granger Cause BR		0.05826	0.9435	
CRR does not Granger Cause OPBPC	43	0.27055	0.7644	No causality
OPBPC does not Granger Cause CRR		1.08635	0.3477	
SLR does not Granger Cause OPBPC	43	0.45952	0.6350	No causality
OPBPC does not Granger Cause SLR		2.90013	0.0673	
RR does not Granger Cause OPBPC	43	0.21456	0.8079	No causality
OPBPC does not Granger Cause RR		0.04968	0.9516	
RRR does not Granger Cause OPBPC	43	0.23225	0.7939	No causality
OPBPC does not Granger Cause RRR		0.49318	0.6145	
MSF does not Granger Cause OPBPC	43	0.77794	0.4665	No causality
OPBPC does not Granger Cause MSF		0.10079	0.9044	
BR does not Granger Cause NET PROFIT	43	0.43160	0.6526	No causality
NET PROFIT does not Granger Cause BR		0.17895	0.8368	
CRR does not Granger Cause NET PROFIT	43	0.24657	0.7827	No causality
NET PROFIT does not Granger Cause CRR		0.11739	0.8896	
SLR does not Granger Cause NET PROFIT	43	2.04124	0.1439	No causality
NET PROFIT does not Granger Cause SLR		0.23607	0.7909	
RR does not Granger Cause NET PROFIT	43	1.58831	0.2175	No causality
NET PROFIT does not Granger Cause RR		0.34889	0.7077	
RRR does not Granger Cause NET PROFIT	43	0.88064	0.4228	No causality
NET PROFIT does not Granger Cause RRR		0.86296	0.4300	
MSF does not Granger Cause NET PROFIT	43	0.24021	0.7877	No causality
NET PROFIT does not Granger Cause MSF		0.28995	0.7499	

Lags: 2

Table 5 presents the analysis that unidirectional causality between Income on Discount, Advances and Bills causes CRR, Repo Rate and Reverse repo rate. Income on Discount, Advances and Bills, Income on Investment causes SLR. On the other hand CRR and Repo rate cause unidirectional causality on Income on Interest on balances with RBI, whereas in rest of the variables, either of the direction of causality could not be found.

VIII. CONCLUSION

It is concluded that all monetary policy variables have shown an impact on operational performance but none of the variables has directly influenced the Net profit of the bank. Other than monetary policy variables the other factors influencing the net profitability may be such as adjustments of provisions and contingencies before realisation of the net profit. But it is found that Income on Discount, Advances and Bills and Operating Profit before Provisions and Contingencies were impacted by all monetary policy variables taken together, there was no significant change in other dependent variables - Income on Investments, Income on Interest on balances with RBI and Net Profit. The other hand it can also concludes that Income on Discount, Advances and Bills positively respond to shock or innovations or changes lead to convergence. Whereas income on investments found very volatile responses at all the level of the lags of all independent variables except Reverse Repo rate, the Income on Interest on balances with RBI respond to Bank rate, SLR, Repo rate and Reverse repo rate at every level of lag. The other hand operating profit influenced by every shock in the monitory policy variable at positive as well as negative response found except Reverse repo rate, the net profit found respond to shocks in SLR, CRR and RR positively and MSF found negatively. Further, Income on Discount and Advances and Bills cause CRR Repo Rate and Reverse repo rate. The Income on Discount, Advances and Bills, Income on Investment causes by SLR.

On the other hand CRR and Repo rate cause unidirectional causality on Income on Interest on balances with RBI, whereas in rest of the variables, either of the direction of causality could not be found.

The present study found consistent and similar results with Omankhanlen (2014) [11]; Udeh (2015) [12]; Ekpung *et al.,* 2015 [13] and Nguyen *et al*., (2017) [14] that one or other monetary variable influencing the operational performance revenue at various levels but a different result found in terms of net profit is concerned none of the monetary policy found significant impact.

IX. FUTURE SCOPE

The study found that the monetary variable influencing the operational performance in terms of various levels of bank income but none of the variable shown has a direct impact on Net profit of the bank, hence the other factor might be influencing the net profit, therefore there is scope to investigate the significance of other macro economic variables and bank specific variables like Non Performing Assets that may influence the net profitability of the bank.

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