

Impact of capital, banking regulation, liquidity and risk on profitability: Case of Public Sector Banks in India

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Abstract

Public Sector Banks (PSBs) play significant role in the growth and development of an economy. Growing NPAs causing lower profitability for the Banks in India especially in the public sector banks. Basel III prescribed stringent norms compared to the norms prescribed by Basel II. PSBs sufficiently comply the requirements of the Basel III and RBI norms. Present study aimed to find the relationships between bank Capital, Banking regulations, Bank risk, liquidity and bank profitability of public sector banks in India. It was found that where Basel II era positively impacted the profitability of public sector banks in India stringent guidelines of Basel III had a negative impact on banks profitability. Non-Performing assets and liquidity had negatively impacted profitability of public sector banks.

Key Words: *Bank Capital, Banking regulations, Bank risk, liquidity and bank profitability*

Introduction

In India, the Public Sector Banks (PSBs) play a significant role in the growth and development of economy. In our country, the majority of infrastructure financing is done by Public Sector. Restructured projects and Growing NPAs causing lower profitability for the Banks. Basel Committee for Banking Supervision proposed Basel norms to ensure adequate capital and liquidity to meet obligations and unexpected losses. So far, three sets of Norms have been proposed by the Basel Committee. In India Basel I norms was adopted in the year 1999. Later, it was replaced by Basel II in 2008. Basel III was introduced in 2010 as a response to the financial crisis of 2008. It prescribed stringent norms for capital, leverage, funding and liquidity as compared to the norms prescribed by Basel II. Public sector banks in India have sufficient capital to comply the requirements of the RBI norms. This study aimed to find the relationships between bank Capital, Banking regulations, Bank risk, liquidity and bank profitability of public sector banks in India. Various studies have been conducted in the

past to investigate the relationships of bank performance with bank Capital, banking regulations, Bank risk, liquidity, however, Earlier studies has not investigated how the profitability of the public sector banks is impacted by these variables in the presence of bank specific variables, macroeconomic variables and financial events. This study used a panel regression method on a sample of 21 public sector Banks in India to investigate the relationship between bank Capital, Banking regulations, Bank risk, liquidity and bank profitability.

Review of Literature

Kumar & Gulati (2010) revealed that higher efficiency don't denote increase in effectiveness in Public Sector Banks in India. Effectiveness and performance measures found to be positively and strongly correlated. Kayode et. Al. (2015) found that credit risk can reduce bank profitability, a reliable credit risk management strategy should be adopted by the banks. Majumder and Rahman (2016) found significant difference in financial performance of the fifteen banks in Bangladesh during 2009-2013 and suggested to improve the weakness of lower ranking banks. Rahman (2018) found a negative relation between risk taking and capital regulation. Majumder & Li (2018) found the bank performance to be positively influenced by bank capital, and risk to be negatively impacted by the bank capital. They also found inverse relationship between performance and risk. Chaluvadi et. al. (2018) assessed more productivity of private sector banks in comparison to public sector banks.

Objectives of the study

The present study was conducted to meet the following objectives.

- To examine the relationship of bank capital with profitability of PSBs in India.
- To investigate the relationship of risk with profitability of PSBs in India.
- To assess the impact of banking regulations on profitability of PSBs in India.
- To examine the impact of liquidity on the profitability of PSBs in India.

Hypotheses of the study

To achieve the objectives of the study, following null hypotheses were framed and tested.

- H_{01} : There is no significant impact of bank capital on profitability of PSBs

- H_{02} : There is no significant impact of bank risk on profitability of PSBs
- H_{03} : There is no significant impact of banking regulations on profitability of PSBs
- H_{04} : There is no significant impact of bank liquidity on profitability of PSBs

Research design

Various ratios used as proxy measures in the study were extracted from the database of Reserve bank of India. Besides RBI database, various journals and web sources were also used as secondary sources of data. A sample of 21 public sector banks were considered for the present study. Only those public sectors banks were selected for the study which were operational during the period of the study and whose data were available in the RBI database for the period from 2005 to 2018.

Table 1: Descriptions of the variables

Variables	Proxy Measures	Acronym
Dependent Variable		
Profitability	Net Interest Margin	NIM
Independent Variables		
Bank Capital	Capital Adequacy Ratio	CAR
Risk	Net Non-Performing Assets to Net Advance	NNPANA
Liquidity	Liquid assets to Total assets Ratio	LATA
	Cash Deposit Ratio	CDR
Banking Regulations	Basel II Era (Dummy)	B2
	Basel III Era (Dummy)	B3
Bank Specific Variables		
Priority sector lending	Priority sector advance to total advance	PSATA
Total Assets	Log of assets	LNA
Macroeconomic variables		
Economic Growth	Gross Domestic Growth Rate	GDP
Inflation	Consumer Price Index	CPI
Financial Events		
	Financial Crises (Dummy)	FC
	Demonetization (Dummy)	Demon

Present paper tried to find the relationship of bank capital, bank risk and banking regulation on profitability of public sector banks in India under a set of control variables to account for banks specific characteristics and macroeconomic variables and national and global financials events with the help of Panel Regression Analysis. Descriptions of dependent, independent and control Variables used for the analysis are given in table 1.

Model Specification

The study assess the effect of bank capital, bank risk, banking regulation and liquidity on profitability of public sector banks in India under a set of control variables to account for banks specific characteristics and macroeconomic variables and financial events using Panel Regression Analysis.

$$\text{NIM}_{it} = \beta_1 + \beta_2 \text{CAR}_{it} + \beta_3 \text{B2}_{it} + \beta_4 \text{B3}_{it} + \beta_5 \text{NNPANA}_{it} + \beta_6 \text{CDR}_{it} + \beta_7 \text{LATA}_{it} + \beta_8 \text{PSATA}_{it} + \beta_9 \text{OFFBTA}_{it} + \beta_{10} \text{GDP}_{it} + \beta_{11} \text{CPI}_{it} + \beta_{12} \text{FC}_{it} + \beta_{13} \text{Demon}_{it} + \varepsilon_{it}$$

Here, subscript i show the cross-sectional dimension across the banks, subscript t indicates years and ε refers to the error term. NIM indicates bank profitability measured by Net Interest Margin, β is the constant term, CAR is the bank capital measured by the Capital Adequacy Ratio. NNPANA is the Bank Risk has measured by Net Non-performing assets to Total Advance. CDR is cash deposit ratio and LATA is the liquid assets to total assets ratio. PSATA is priority sector advance to total advance, LNA is natural log of Assets proxy for size of the firm, GDP and CPI are macroeconomic variables. B2 & B3 are dummies used for Basel Eras. For Basel II, a value of 1 was taken for the year from 2008 to 2013 and zero for other years. For Basel III, a value of 1 was taken for the year from 2014 to 2018 and zero for other years. FC and Demon are dummies for financial events that is financial crises and demonetization, respectively. For FC, a value of 1 was taken for the years 2008 and 2009, zero otherwise. For demon value of 1 was used for the year 2017 and zero otherwise. The relationships of variables were estimated using panel regression analyses, where Both fixed effects and random effects model were estimated and Hausman test was used to decide which estimation, Random Effects or Fixed Effects, better estimates the relationships.

Results of data analysis

This section of study shows descriptive statistics of all the variables, correlation matrix among the variables and the panel regression analysis for 14 years of observations.

Descriptive statistics

Table 2 highlights the descriptive statistics of proxy measures of the variables used in the study. The profitability measure, NIM has a mean value of 2.45 with a variation of 0.59. The maximum and minimum values of NIM are 3.78 and 0.23, respectively. Mean CAR has is 12.21, indicates capital adequacy maintained by public sector banks in India is higher than

the required level. The Standard deviation of NNPA (3.22) indicates position of financial stability of banking system. Mean value of CDR (6.50) indicates satisfactory liquidity position of banks during study period. Mean Value of LATA (8.44) also shows better liquidity position of the banks. The mean value of PSATA shows that the banks have provided, on an average, 33.47 % of their total advances to priority sectors with a variation of 6.25 %.

Table 2: Descriptive Statistics of Variables

	NIM	CAR	NNPANA	CDR	LATA	LNA	PSATA	OFFBTA
Mean	2.453610	12.21048	2.992041	6.509643	8.449454	14.19615	33.47003	108.4901
Median	2.427056	12.17000	1.720000	5.904497	7.925445	14.28638	33.80997	35.29967
Maximum	3.781489	18.16000	16.69000	25.30976	23.62510	17.35785	50.05337	2877.917
Minimum	0.230890	8.690000	0.150000	2.736197	2.798055	10.52989	9.510858	5.431998
Std. Dev.	0.599694	1.336178	3.222945	2.452274	3.018548	1.093383	6.256304	353.4906
kewness	-0.239654	0.288433	1.874120	2.673787	1.535735	-0.446062	-0.380247	5.623157
Kurtosis	3.616040	3.916980	6.299500	16.79637	7.324816	4.150397	3.692794	36.34720
Jarque-Bera	7.463218	14.37692	305.4661	2681.970	344.6900	25.96142	12.96436	15171.81
Probability	0.023954	0.000755	0.000000	0.000000	0.000000	0.000002	0.001530	0.000000
Sum	721.3614	3589.880	879.6600	1913.835	2484.139	4173.668	9840.187	31896.09
Sum Sq. Dev.	105.3724	523.1135	3043.501	1761.999	2669.708	350.2774	11468.41	36611999
Obs	294	294	294	294	294	294	294	294

Multicollinearity check

Correlation matrix of the proxy measures of the variables was used to examine multicollinearity problem among independent variables in the panel regression model. The highest correlation of -0.581 was found between NNPA and CPI. However, the correlation value was below the threshold value of 0.70 indicating no multicollinearity problem between the variables (Kennedy, 2003), hence no problem of multicollinearity exist between the independent variables.

Table 3: Correlation matrix

	CAR	NNPANA	CDR	LATA	LNA	PSATA	OFFBTA	GDP	CPI
CAR	1.000000	-0.488802	0.098742	-0.101320	0.266775	-0.255426	0.014443	-0.141181	0.357849
NNPANA	-0.488802	1.000000	-0.200340	0.159919	-0.466540	0.326702	0.032956	0.215176	-0.581624
CDR	0.098742	-0.200340	1.000000	-0.247656	0.173048	0.096194	0.022265	0.080040	0.128887
LATA	-0.101320	0.159919	-0.247656	1.000000	0.097292	-0.102197	-0.106974	0.062190	-0.227380
LNA	0.266775	-0.466540	0.173048	0.097292	1.000000	-0.327999	-0.476733	-0.070562	0.229172

PSATA	-0.255426	0.326702	0.096194	-0.102197	-0.327999	1.000000	0.038843	0.229375	-0.354265
OFFBTA	0.014443	0.032956	0.022265	-0.106974	-0.476733	0.038843	1.000000	0.012776	0.060241
GDP	-0.141181	0.215176	0.080040	0.062190	-0.070562	0.229375	0.012776	1.000000	-0.479274
CPI	0.357849	-0.581624	0.128887	-0.227380	0.229172	-0.354265	0.060241	-0.479274	1.000000

Results of panel regression analysis

In this section of the study, relationships of variables were estimated with the help of panel regression analyses. The relationships of the variables were estimated by Pooled, fixed and random effects models and Hausman Test was used to decide which estimation, Random Effects or Fixed Effects model better estimates the relationships.

Table 4: Pooled regression analysis

Variables	Coefficients	Std. Error	t-Statistic	Probability value
C	-0.621065	0.629731	-0.986238	0.3249
CAR	0.031022	0.020222	1.534099	0.1261
B2	0.470151	0.134188	3.503668	0.0005*
B3	-0.180895	0.091755	-1.971513	0.0496**
NNPANA	-0.090802	0.011611	-7.820386	0.0000*
CDR	-0.044730	0.010583	-4.226367	0.0000*
LATA	-0.001837	0.007997	-0.229661	0.8185
LNA	0.182970	0.031285	5.848442	0.0000*
PSATA	0.060504	0.004492	13.47019	0.0000*
OFFBTA	0.000164	7.72E-05	2.118797	0.0350**
GDP	-0.062486	0.020266	-3.083291	0.0023*
CPI	-13.34752	2.427865	-5.497637	0.0000*
FC	-0.518328	0.089858	-5.768312	0.0000*
DEMON	-0.356094	0.114643	-3.106103	0.0021*
R ²	0.625288			
Adjusted R ²	0.607891			
F-stat	35.94166			
Probability value F-statistic	0.000000			
Durbin-Watson statistics	0.474263			

*1% level of significance

**5% level of significance

***10% level of significance

In case of Pooled regression analysis, 62.52 % of variation in Profitability is explained by the independent variables. Basel II era had a significant and positive impact on profitability of public sector banks while bank risk and liquidity had a negative and significant relationship with profitability. As can be seen from figure 1, the residual term is not normally distributed. However, the Pooled estimation is simply an Ordinary Least Square technique run on Panel data.

Figure 1: Normality of Residual in Pooled Regression model

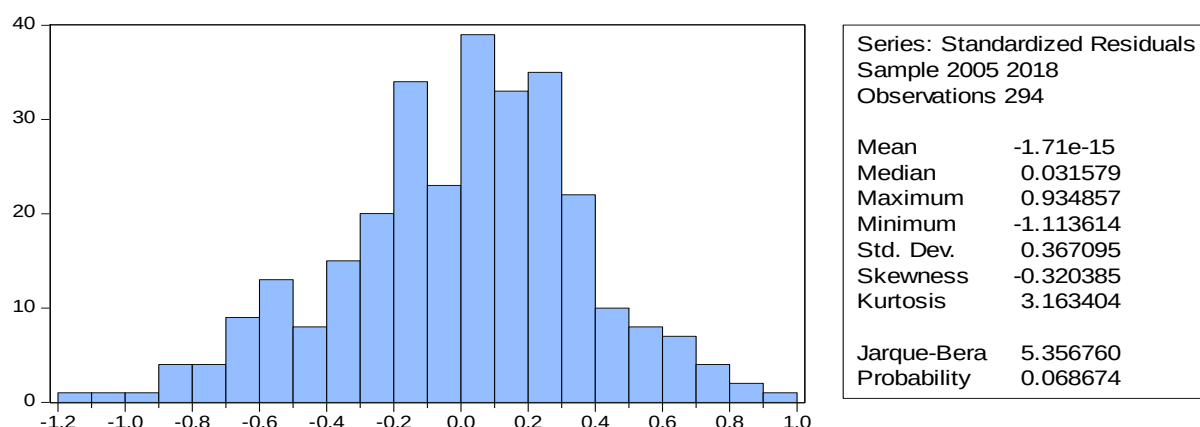


Table 5: Fixed effects regression analysis

Variables	Coefficients	Std. Error	t-Stat	Probability
C	0.566506	0.969596	0.584270	0.5595
CAR	0.026651	0.018159	1.467678	0.1434
B2	0.345002	0.116604	2.958753	0.0034*
B3	-0.308629	0.097164	-3.176391	0.0017*
NNPANA	-0.076585	0.011601	-6.601495	0.0000*
CDR	-0.039455	0.009403	-4.195977	0.0000*
LATA	-0.013494	0.007779	-1.734583	0.0840***
LNA	0.133500	0.061061	2.186350	0.0297**
PSATA	0.048199	0.005832	8.264288	0.0000*
OFFBTA	0.000105	0.000118	0.894202	0.3720
GDP	-0.055753	0.016719	-3.334646	0.0010*
CPI	-12.60830	1.964392	-6.418422	0.0000*
FC	-0.471214	0.078030	-6.038897	0.0000*
DEMON	-0.359425	0.091955	-3.908723	0.0001*
R ²	0.778227			
Adjusted R ²	0.750079			
F-stat	27.64753			
Probability value F-statistic	0.000000			
Durbin-Watson statistics	0.719781			

*1% level of significance

**5% level of significance

***10% level of significance

Table 5 highlights the fixed effects panel regression model estimates. Basel II era was found to have a positive significant impact on profitability of public sector banks whereas Basel III era was found to have a negative and significant relation with profitability of sampled banks. Bank risk and bank liquidity were found to have a negative significant impact on banks' profitability. Jarque Bera test indicates that residual term is not normally distributed.

Figure 2: Normality of Residual in Fixed Effects Regression model

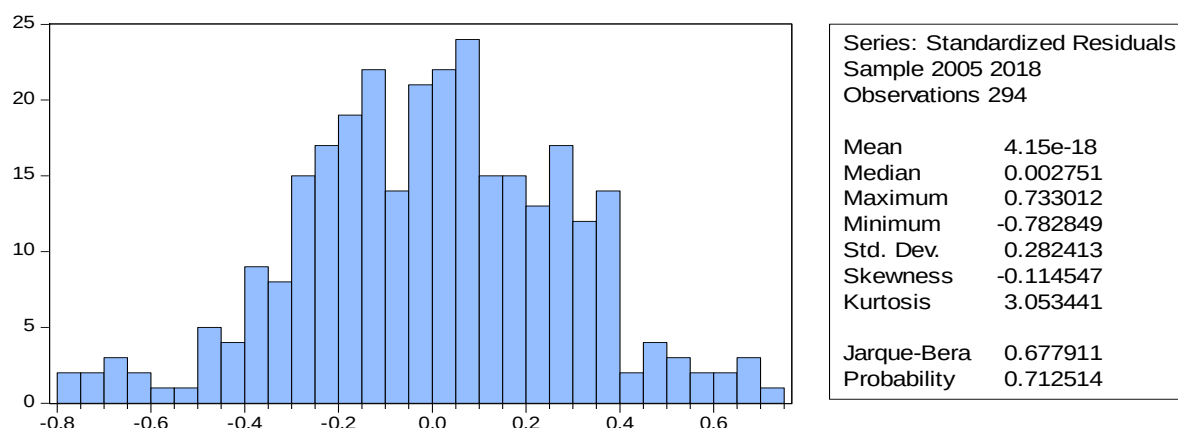


Table 6: Random effects regression analysis

Variables	Coefficients	Std. Error	t-Statistic	Probability
C	0.304383	0.808111	0.376660	0.7067
CAR	0.027496	0.017900	1.536078	0.1256
B2	0.368450	0.113905	3.234723	0.0014*
B3	-0.281840	0.089654	-3.143651	0.0018*
NNPANA	-0.078698	0.011043	-7.126459	0.0000*
CDR	-0.040179	0.009303	-4.318907	0.0000*
LATA	-0.012175	0.007605	-1.601055	0.1105
LNA	0.146584	0.047957	3.056578	0.0025*
PSATA	0.050204	0.005412	9.275717	0.0000*
OFFBTA	0.000107	0.000105	1.022426	0.3075
GDP	-0.057086	0.016633	-3.432151	0.0007*
CPI	-12.74841	1.957780	-6.511667	0.0000*
FC	-0.481747	0.076350	-6.309674	0.0000*
DEMON	-0.358688	0.091808	-3.906923	0.0001*
R ²	0.646080			
Adjusted R ²	0.629648			
F-stat	39.31839			
Probability value F-statistic	0.000000			
Durbin-Watson statistics	0.687647			

*1% level of significance

**5% level of significance

***10% level of significance

Table 6 shows the random effects panel regression model estimates. Results were consistent with that of fixed effects model. Basel II era have a positive and significant relationship with profitability of public sector banks whereas Basel III era was found to have a negative and significant impact on profitability of public sector banks. Bank risk and bank liquidity were found to have a negative and significant impact on banks' profitability. Probability of JarquaBera test statistics indicates that residual is normally distributed.

Figure 3: Normality of Residual in Random Effects Regression model

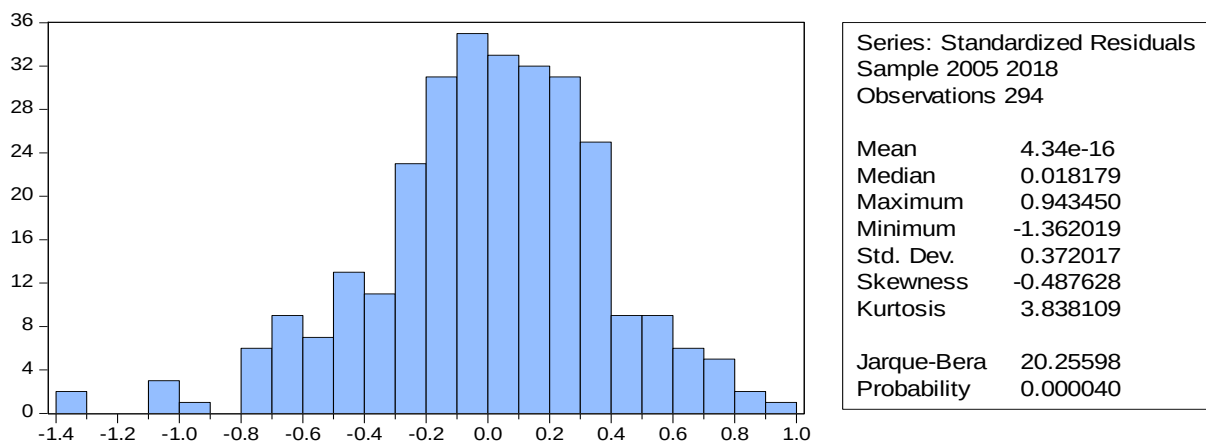


Table 7: Hausman Test

Summary	Chi-Square Statistic	Chi-Square d.f.	Probability
Cross-section random	0.000000	13	1.0000

Based on the results of Hausman test given in the table 7, Random effects model was found to be appropriate on among the pooled, random and fixed effects model.

Results of Hypotheses Testing

As the random effects model was found to be appropriate model, the relationships of variables have been interpreted based on random effects panel regression model. Table 6 shows the random effects panel regression model estimates. CAR had insignificant impact on banks' profitability therefore null hypotheses H_{01} can be accepted. Dummy variable B2 positively and significantly impacted NIM at 1% level of significance indicating that Basel II era have a positive and significant relationship with profitability of public sector banks whereas Dummy variable B3 negatively and significantly impacted NIM at 1% level of significance, showing Basel III era was found to have a negative and significant impact on profitability of public sector banks. Hence null hypotheses H_{02} can be rejected at 1% level of significance. NNPA had a negative and significant impact on NIM showing Bank risk had a negative and significant impact on banks' profitability. Therefore, null hypotheses H_{03} can be rejected at 1% level of significance. CDR had a negative and significant impact of profitability of PSBs, indicating negative relationship of liquidity with profitability of banks, Hence, Null hypotheses H_{04} can be rejected at 1% level of significance.

Conclusion

Basel II era have positively influenced the profitability of public sector banks in India whereas Basel III era was found to have a negative impact on banks profitability indicating that the new guidelines in form of Basel III norms are more strict than the earlier requirements for capital and liquidity in Basel II norms. Non-performing assets are the major concerns of the public sectors banks. Non-Performing assets had negatively impacted profitability of public sector banks. Bank liquidity had negative relationship with the profitability of banks during the study period.

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