Statistical Analysis of Regressed Variables of Capital Adequacy: A Case study of Indian Private Sector Banks

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Abstract

The maintenance of capital adequacy is pre-requisite to attain various port-folio objectives of the commercial banks. The capital adequacy depends upon so many regressed or independent variables like advances, asset efficiency, operational efficiency, liquidity, net worth, returns on equity, share of deposits, GDP growth rate, port-folio risks etc. The present study focuses on five selected determinants of capital adequacy i.e. advances, asset efficiency, operational efficiency, liquidity, net worth. For this twenty private sector banks have been selected randomly and the relevant data has been collected from the annual reports of these banks. Various statistical techniques like correlation, multiple regression and ANOVA have been applied to analyze the data. The results have shown that Indian private sector banks have maintained higher capital adequacy ratio than the mandatory limit of 9% as set by RBI and they have excessive funds to advance more funds to public by protecting their solvency. The study has also found that capital adequacy is negatively associated with advances, asset efficiency and operational efficiency but it is positively and significantly correlated with liquidity and net worth. Regression results revealed the fact that regression coefficients of capital adequacy ratio on advances, liquidity and net worth are statistically <u>significant</u>, whereas the dependence of capital adequacy ratio on asset efficiency and operational efficiency is <u>insignificant</u>.

Keywords: Capital Adequacy, Advances, Asset efficiency, Operational efficiency, Liquidity, Net worth, Multiple Regression, Correlation, ANOVA.

Introduction

In order to achieve capital adequacy measure in a phased manner by commercial banks in India, RBI introduced Capital to Risk Weighted Asset Ratio (CRAR) on the recommendations of the Narasimhan Committee Report (Singh,Vyas 2009). Capital to Risk Weighted Asset Ratio (CRAR) is also known as Capital Adequacy Ratio (CAR) and it signifies the ability of the firm that liability could be honored. The higher the CRAR, the stronger the bank is. In banking sector of India various prudential norms were introduced as this sector is one of the most leveraged sectors of the economy and is exposed to high

risks. It has given birth to the debate that whether capital adequacy requirement is the right track to regulate the banking system (Pasha, Swamy 2012). The bank should have sufficient amount of capital to maintain depositors confidence, to absorb unexpected losses and to prevent the bank from going bankrupt (Reddy, 2012).

Review of Literature

- **Ongore and Kusa (2013),** investigated that capital is one of the specific factors which affects the profitability and has positive and strong association with bank performance.
- **Buyuksalvarc and Abdioglu (2012),** found that the capital adequacy ratio is largely affected by the bank size, liquidity, deposits and profitability.
- Williams (2011), found that the most important predictors of the determinants of capital adequacy in Nigeria are demand deposits, return on investment, money supply, inflation rate, exchange rate and political stability.
- Sangmi and Nazir (2010), argued that capital adequacy is directly proportional to resilience of the bank to crisis situations and has direct effect on profitability.
- Koch (2010), found that high returns on equity are determined by the smaller equity base because it has greater financial leverage and equity multiplier.
- Ho and Hsu (2010) found that in Taiwan, bank's risky investment strategies are largely affected by restrictions on capital adequacy because market share and leverage are positively associated.
- Mathuva (2009), investigated that there is positive correlation between bank profitability and core capital ratio and tier 1 risk based capital ratio.
- Asarkaya and Ozcan (2007), found that share of deposits are negatively correlated with capital adequacy ratio whereas return on equity, economic growth, portfolio risk and lagged capital are positively correlated with capital adequacy ratio.
- Al-Sbbagh (2004), investigated that there is positive correlation between dividend payout ratio, return on equity, loan to asset ratio and capital adequacy ratio whereas size of bank, loan provision ratio, deposit asset ratio are negatively associated with capital adequacy ratio.

Objective

The objective of the paper is to analyze the impact of selected regressed or independent variables like advances, asset efficiency, operational efficiency, liquidity, net worth on capital adequacy ratio.

Research Methodology

Since study is descriptive in nature therefore the data has been complied and collected from secondary source like annual reports of twenty banks selected for the study. A period of five years (2008-12) has been taken for the study. Various statistical techniques like correlation, multiple regression and ANOVA have been applied to analyze the data.

Terminology Used

In order to study the impact of selected <u>regressed or independent variables like advances</u>, <u>asset</u> <u>efficiency</u>, <u>management efficiency</u>, <u>liquidity and net worth</u> on <u>dependent variable capital adequacy ratio</u>, following terminologies have been used:

 Advances (AD): The major source of earnings of the banks is the advances. The ratio of total advances to total assets is used to find out the existing relationship among total advances of banks to its total assets. The profitability of the banks depends upon this ratio.

It is calculated as: **Total Advances/Total Assets**

2) Asset Efficiency (AE): The financial strength of the commercial bank is judged by the efficiency of the assets which is calculated as the percentage of the net non-performing assets to net advances.

It is calculated as: Net Non performing assets/Net advances

- 3) Operational Efficiency (OE): The operational efficiency is nothing but the ratio of operating expenditure to total income. Higher operational efficiency ratio adversely affects the profitability of the bank. This ratio measures the growth and survival of the commercial bank. It is calculated as: Operational Expenditure/Total Income
- 4) Liquidity (LQ): Liquidity is one of the major objectives of the port-folio management of the commercial banks. It refers to the ability of the bank to meet its obligations of demand deposits. The goodwill of the bank and public confidence on banking system largely depends upon liquidity. The most liquid asset of the bank is cash in hand and money at call or short notice.

It is calculated as: *Liquid Assets/Total Assets*

5) Net Worth (NW): Net worth is the difference between risk sensitive assets and risk sensitive liabilities of the bank.

It is calculated as: Risk Sensitive Assets – Risk Sensitive Liabilities

6) Capital Adequacy Ratio (CAR) : Capital adequacy ratio is a measure of the amount of bank's core capital expressed as a percentage of its risk-weighted asset.
It is calculated as:

Tier 1 Capital = (Paid up capital+ statutory reserves + disclosed free reserves) – (Equity investments in subsidy + intangible assets + current & b/f losses)

Tier 2 Capital = Undisclosed reserves + General loss reserves + Hybrid debt capital instrument and subordinated debts.

Model and Hypotheses Formation

For the present study multiple regression model and hypotheses are specified as under:

$$Ci = \beta + b1AD + b2AE + b3OE + b4LQ + b5NW + \mu i$$

where,

- C_i = Capital Adequacy Ratio (CAR).
- β = Value of Intercept i.e. constant.

b_i = Regression Coefficients.

$\mu_{i=}$ Residual Term

- **a**) H_{01} : The impact of advances on capital adequacy ratio is statistically *insignificant*.
- **b**) **H**₀₂: The impact of asset efficiency on capital adequacy ratio is statistically *insignificant*.
- c) H₀₃: The impact of operational efficiency on capital adequacy ratio is statistically *insignificant*.
- d) H_{04} : The impact of liquidity on capital adequacy ratio is statistically <u>insignificant</u>.
- e) H_{05} : The impact of net worth on capital adequacy ratio is statistically <u>insignificant</u>.

Analysis, Results and Interpretations

The following table shows the average values of selected ratios for different variables under study for the period 2008-2012:

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Bank	Capital Adequacy	Liquidity	Net Worth	Advanc es	Asset Efficiency	Operational Efficiency
ICICI	17.60	8.89	105.51	54.23	1.60	74.89
Yes Bank	17.06	7.21	104.99	56.2	0.12	76.21
HDFC Bank	15.90	10.3	107.08	54.83	0.36	77.41
ING Vysya Bank	12.76	8.39	100.50	57.34	0.77	82.36
J&K Bank	14.06	10.61	100.29	54.89	0.62	73.89
Catholic Bank	11.26	9.47	95.89	58.59	1.69	92.26
Indusind Bank	13.86	8.46	98.19	57.69	0.89	81.89
City Union Bank	12.79	9.09	98.4	62.24	0.76	75.46
Kotak Mahindra Bank	18.89	5.32	112.38	57.12	1.46	74.89
Ratnakar Bank	41.06	19.3	110.05	51.86	0.69	77.79
Axis Bank	13.90	8.76	99.74	57.18	0.36	70.89
Federal Bank	18.89	7.56	105.29	60.39	0.46	70.76
Karnatka Bank	12.84	6.58	100.89	54.60	1.40	83.54
South Indian Bank	14.39	8.35	98.49	62.26	0.49	81.14
Dhanalakshmi Bank	11.77	9.34	94.35	58.76	0.71	92.65
Karur Vysya Bank	14.14	6.68	100.72	62.72	0.21	76.87
Luxmi Vilas Bank	12.82	8.16	97.84	61.16	1.90	83.43
Nanital Bank	14.50	25.62	83.31	47.78	0.00	72.63
Tamilnad Mercantile Bank	15.36	8.34	98.49	63.16	0.49	81.14
Development Credit Bank	14.04	7.00	103.71	56.80	0.33	74.69

Source: Annual Reports of Various Banks Under Study (2008-12)

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SPSS OUTPUT FILE: 1

		-					
	N				Std.	ci .	
	N	IVIInimum	Iviaximum	Mean	Deviation	SKev	vness
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Capital Adequacy	20	11.26	41.06	<u>15.8945</u>	6.30265	3.660	.512
Liquidity	20	5.32	25.62	<u>9.6715</u>	4.66949	2.731	.512
Net Worth	20	83.31	112.38	<u>100.8055</u>	6.20937	<u>-0.720</u>	.512
Advances	20	47.78	63.16	<u>57.4900</u>	3.91186	<u>-0.560</u>	.512
Asset Efficiency	20	.00	1.90	<u>0.7655</u>	.55457	.770	.512
Operational	20	70 76	02.65	78 7205	6 11807	008	512
Efficiency	20	70.70	92.05	<u>70.7355</u>	0.11097	.990	.512

Descriptive Statistics

Interpretations:

- The mean value of debt is 57.49% which indicates that major source of income of these private sector banks is from advances i.e. income from interest.
- The mean value of asset efficiency is 0.76% which is within the stipulated limits of RBI.
- The mean value of operational efficiency is quite high i.e.78.73%. This high ratio adversely affects the profitability of the banks.
- The independent variables advances and net worth are negatively skewed.
- The average of capital adequacy ratio which the private sector banks are maintaining is 15.89% which means that Indian private sector banks have maintained higher capital adequacy ratio than the mandatory limit of 9% as set by RBI and they have excessive funds to advance more funds to public by protecting their profitability.

SPSS OUTPUT FILE 2:

			Correl	ations			
		Capital Adequacy Ratio	Liquidity	Net Worth	Advance s	Asset Efficiency	Operational Efficiency
Capital Adequacy Ratio	Pearson Correlation	1					
Liquidity	Pearson Correlation Sig. (2- tailed)	<u>0.419*</u> .036	1				
Net Worth	Pearson Correlation Sig. (2- tailed)	<u>0.528*</u> .017	451 [*] .046	1			
Advances	Pearson Correlation Sig. (2- tailed)	-0.358 .121	690 [*] .001	.060 .803	1		
Asset Efficiency	Pearson Correlation Sig. (2- tailed)	-0.080 .738	302 .196	.165 .487	.102 .669	1	
Operational Efficiency	Pearson Correlation Sig. (2- tailed)	-0.255 .279	162 .496	280 .231	.255 .279	.455 [*] .044	1

*. Correlation is significant at the 0.05 level (2-tailed).

Interpretations:

 As all variables have correlation value less than 0.80 therefore, none of the independent variables show multicollinearity¹.

¹ If correlation is more than 0.8 or more then the problem of multicollinearity exists. (Cooper and Schindler,2003).

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- Capital adequacy ratio is negatively associated with advances, Asset efficiency and operational efficiency.
- Capital adequacy ratio is positively associated with liquidity and net worth and this association is statistically significant.

SPSS OUTPUT FILE 3:

Model Summary

			Adjusted R	Std. Error of	
Model	R	R Square	Square	the Estimate	Durbin-Watson
1	.945 ^ª	.894	<u>0.856</u>	2.39425	<u>1.948</u>

a. Predictors: (Constant), OE, LQ, AE, NW, AD

b. Dependent Variable: CA

ANOVA								
Model		Sum of Squares	df	Mean Square	F	Sig.		
1	Regression	674.491	5	134.898	<u>23.532</u>	<u>0.000</u>		
	Residual	80.254	14	5.732				
	Total	754.745	19					

a. Dependent Variable: CA

b. Predictors: (Constant), OE,LQ , AE, NW, AD

			Coeff	icients		
		Unstandardized Coefficients		Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	-153.026	23.937		-6.393	.000
	Liquidity*	1.564	.206	1.159	<u>7.592</u>	<u>0.000*</u>
	Net Worth*	1.092	.117	1.075	<u>9.329</u>	<u>0.000*</u>
	Advances*	0.546	.215	.339	<u>2.537</u>	<u>0.024*</u>
	Asset Efficiency	-0.141	1.216	012	116	.909
	Operational Efficiency	0.158	.115	.153	1.375	.191

a. Dependent Variable: CA

b. Regression coefficients with* are statistically significant at 5% level of significance.

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Interpretations:

- Since the number of independent variable under study is more than one, therefore the value of adjusted R-Square is considered instead of R-Square. Clearly the value of adjusted R-Square is 0.856 and it can be concluded that around 85% of changes in capital adequacy of the banks under study are explained by independent variables. Moreover the Durban-Watson² test value is 1.948 which shows that there is no autocorrelation.
- F-value of ANOVA³ is 23.532 and this value is significant because p-value 0.00 is less than LOS at 5%. It may be concluded that the effect of independent variables under study on dependent variable is significant. Hence the overall strength of the regression model is good.
- The multiple regression equation is formed as :

$Ci = -153.026 + 1.564LQ + 1.092NW + 0.546AD - 0.141AE + 0.1580E + \mu i$

- The regression coefficient of advances on capital adequacy is 0.546 and the p-value is less than the sig-value at 5% LOS, therefore null hypothesis H₀₁ is rejected and it can be concluded that the impact of advances on capital adequacy ratio is statistically <u>significant.</u>
- The regression coefficient of asset efficiency on capital adequacy is -0.141 and the p-value is more than the sig-value at 5% LOS, therefore null hypothesis H₀₂ is accepted and it can be concluded that the impact of asset efficiency on capital adequacy ratio is statistically <u>insignificant.</u>
- The regression coefficient of operational efficiency on capital adequacy is 0.158 and the p-value is more than the sig-value at 5% LOS, therefore null hypothesis H₀₃ is accepted and it can be concluded that the impact of operational efficiency on capital adequacy ratio is statistically insignificant.
- The regression coefficient of liquidity on capital adequacy is 1.564 and the p-value is less than the sig-value at 5% LOS, therefore null hypothesis H₀₄ rejected and it can be concluded that the impact of liquidity on capital adequacy ratio is statistically <u>significant</u>.

² The value of Durban-Watson statistic is always between0 to 4. The value 2 means that there is no auto correlation. Value approaching 0 means positive autocorrelation and value approaching 4 means negative autocorrelation.

³ ANOVA is one of the important applications of F-test and is used to test the overall strength of the model under study.

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The regression coefficient of net worth on capital adequacy is 1.092 and the p-value is less than the sig-value at 5% LOS, therefore null hypothesis H_{05} is rejected and it can be concluded that the impact of net worth on capital adequacy ratio is statistically *significant*.

Conclusion

The upshot of the above is that out of five independent variables under study only three variables i.e. advances, liquidity and net worth have significant impact on capital adequacy ratio. The SPSS output file has clearly shown that the impact of advances on capital adequacy ratio is statistically significant indicating the fact that the profitability of the banks increase with the increase in advances. Moreover the impact of liquidity on capital adequacy ratio is also found to be statistically significant which means that with the increase in liquidity, the ability of the bank to meet its obligations of demand deposits and cash flow requirements also increases. Furthermore, the impact of net worth on capital adequacy ratio is also found to be statistically significant. The study has also investigated that the impact of asset efficiency on capital adequacy ratio is statistically insignificant. It means that the value of capital gets depreciated with the increase in bad debts and the banks are more prone to the exposure of credit risk. Moreover the impact of operational efficiency on capital adequacy ratio is found to be statistically insignificant. Thus the independent variables such as advances, liquidity and net worth have significant impact on capital adequacy ratio.

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