

# A Study of Macroeconomic Factors Influencing Capital Adequacy Ratio of Schedule Commercial Banks in India

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## ABSTRACT:

Banking industry has been considered as the backbone for smooth functioning and growth of an economy. In a developing country like India banks are expected to perform effectively and efficiently to reach the heights of economic growth. Reserve bank of India ensures such efficiency standards for the whole banking industry in India and also determines capital adequacy standard ratio as per guidelines of BASEL committee. Capital adequacy ratio is considered as an indicator of soundness and safety buffer for absorbing the financial risk of banks. This research paper examines the impact of macroeconomic determinants on capital adequacy ratio of schedule commercial banks in India. Gross domestic product annual growth rate, consumer price index, exchange rate and lending interest rate have been taken as independent variables and capital adequacy ratio has been taken as the dependent variable. The empirical results of regression analysis found that CPI index, exchange rate and lending interest are significant in determining the capital adequacy ratio while GDP is not found significant variable. The study examines the long term relationship between the variable and ARDL model, bound test and Johansen cointegration and Granger causality test have been conducted for this objective.

**Key words:** Capital adequacy ratio, GDP, inflation rate, exchange rate, lending interest rate.

## INTRODUCTION:

Banking industry acts as a financial intermediary between the depositors and investors and plays an important role for the development of whole financial system. After 1991 with the introduction of liberalization, privatization and globalization the face of banking has changed considerably and the focus of Indian banking has been shifted towards management of liquidity risk, market risk, credit risk and operational risk along with routine banking transactions.

Due to lack of proper risk management techniques many banks of the developed and developing countries have to face the challenges of banks failure. Due to such banks failure the attention of international organizations moved towards banking committee on Banking Supervision

The capital adequacy ratio (CAR) is termed as capital to risk-weighted assets ratio which analyses the financial strength of a bank with the help of capital and assets information. Capital adequacy ratio is helpful in protecting the rights of depositors and promotes the stability and efficiency of financial systems. Generally, it has been considered that a bank with a high capital adequacy ratio is safe and can meet its financial obligations timely. A healthy level of banking system depends on the optimum level of capital adequacy ratio. Insolvency of any banking system is a critical situation for any economy which reduces the confidence of the depositors in the banks. To maintain the confidence of depositors and stability among the monetary policies central bank of any country ensures the safety standards in terms of adequacy of capital to meet financial risks. A healthy banking system can face itself from the financial shocks.

The capital adequacy ratio is calculated by dividing the capital of a bank by its risk-weighted assets. This capital can be further divided into two types.

- **Tier-One Capital:** Tier-one capital is the core capital and comprises of the equity capital, ordinary share capital, revenue reserves and intangible assets. Tier-one capital helps to absorb the losses from financial risks and also helps a bank in smooth operations.

- **Tier-Two Capital:** Tier-two capital comprises of those retained earnings and reserves which are unaudited. This capital helps in absorbing the losses during the winding up and liquidation of the company.

Capital adequacy ratio is the total of these two tiers of capital tiers divided by risk-weighted assets. Risk-weighted assets are calculated from a bank's loans, NPAs level and evaluating the risk, and then assigning the weight to each factor.

#### LITERATURE REVIEW:

**Shingjergji and Hyseni (2015)** studied the impact of return on asset, return on equity, non-performing loans, equity multiplier index, bank size of banks and loan to deposit ratio on capital adequacy ratio. They found that ROA and ROE had no effect on capital adequacy ratio, while non-performing loans to deposit ratio and equity multiplier had negative relationship with capital adequacy ratio. On the other hand, bank size was found positively associated with it.

**Nuviyanti and Anggono (2014)** examined the effect of selected financial ratios on capital adequacy ratio and revealed that ROA and non-performing loan had positive correlation with capital adequacy ratio, while operating expenses and loan to deposit ratio were found negatively correlated with CAR.

**Thoa and Anh (2016)** studied the effects of net interest margin, bank size, liquidity, loans in total assets and leverage on capital adequacy ratio. The empirical results found that net interest margin and liquidity had positive relationship with capital adequacy ratio. On the other hand loan loss reserve and loans in total assets had negative effects with CAR while bank size and leverage were not found significant for capital adequacy ratio.

Variable name	Related studies
Economic Growth	Mili et. al. (2016), Yahaya et. al. (2016), Bokhari et. al. (2012), Al-Sabbagh and Magableh (2004)
Inflation Rate	Mili et. al. (2016), Yahaya et. al. (2016), Abba et. al. (2013)
Exchange Rate	Yahaya et. al. (2016), Al-Sabbagh and Magableh (2004)
Interest Rate	Yahaya et. al. (2016), Al-Sabbagh and Magableh (2004)

**Davidoff, Steven, Zaring, Leila Bateni, Serhat Yüksel, Coffee, Chorafas, Brewer et al., Bordo, Bieri, Bayne, Atik, Williams, Al-Sabbagh, Al-Tamimi, Obeidat, Wong and Abba et al.** raised the issue of linkages between Capital Adequacy Ratio and bank-specific variables, macroeconomic variables & other financial sector deregulation. Various macroeconomic and prudential issues growth rate, inflation rate, exchange rate, money supply and lending interest rate affect the capital adequacy level. This study focuses on behavior of macroeconomic variables that are considered outside the internal interference and operations of the banks

#### Hypothesis statement:

1. There is no significant relationship between CRAR and GDP growth rate
2. There is no significant relationship between CRAR and consumer price inflation index.

3. There is no significant relationship between CRAR and exchange rate
4. There is no significant relationship between CRAR and lending interest rate.

## RESEARCH METHODOLOGY:

### Population and Sample

The population of this research is scheduled commercial banks functioning in India. This research study uses purposive and convenience sampling. The data has been take from the period 1991-2017 and is based on combined performance of all schedule commercial banks in India

### Data Collection Method

This research is based on secondary data of schedule commercial banks. The secondary data has been collected from website of RBI through trend and pattern of banking in India of 27 years.

### Analysis Method

In this research paper, multiple regression analysis has been done using E-views 10. Multiple linear regression (MLR) model has been done to get an estimate of a linear relationship of the response ( $yt$ ), and  $\beta$  indicates the linear parameter coefficients estimates to be computed. To check the autocorrelation - Godfrey Serial Correlation LM test and for Heteroskedasticity in the model Breusch- Pegan Godfrey Test for Heteroskedasticity has been used.

## Data Analysis and Interpretation:

**Table: 1 Results for descriptive statistics:**

	CRAR	GDPA	CPI	EXR
Mean	12.15222	4.972963	72.05519	45.10963
Median	12.30000	5.530000	60.85000	45.19000
Maximum	17.70000	8.760000	156.9500	67.16000
Minimum	9.600000	-0.980000	22.87000	22.71000
Std. Dev.	1.652165	2.289175	39.36519	11.24802
Skewness	1.095722	-0.575787	0.782656	0.188552
Kurtosis	5.799907	2.923862	2.485044	2.632035
Jarque-Bera Probability	14.22215 0.000816	1.498410 0.472742	3.054806 0.217099	0.312307 0.855428
Sum	328.1100	134.2700	1945.490	1217.960
Sum Sq. Dev.	70.97087	136.2484	40290.08	3289.470

Table 1 shows the results for descriptive statistics. The mean value 72.055 for CPI is found to be highest. The standard deviation is also found more in the times series of consumer price index and the value is calculated as 39.365. The lowest mean value is 4.972 for GDPA.

### Test Results for ADF unit root test:

To check whether the time series data has unit root or not, Augmented Dickey Fuller test has been used. The test for stationarity has been conducted to ensure that none of the series is integrated at 1(2). The test results indicates that capital adequacy ratio, annual GDP rate, CPI inflation index, exchange rate and lending interest rate are stationary at level and integrated at I(0).

**Table: 2**  
**ADF unit root test:**

	t-Statistic	Prob.*
• Null Hypothesis: CRAR has a unit ... -		
<u>Augmented Dickey-Fuller test statistic</u>	<u>-3.976424</u>	0.0228
• Null Hypothesis: GDPA has a unit root -		
<u>Augmented Dickey-Fuller test statistic</u>	<u>-4.837128</u>	0.0034
• Null Hypothesis: CPI has a unit root -		
<u>Augmented Dickey-Fuller test statistic</u>	<u>-5.358906</u>	0.0002
• Null Hypothesis: EXR has a unit root -		
<u>Augmented Dickey-Fuller test statistic</u>	<u>-4.040110</u>	0.0048
• Null Hypothesis: LINR has a unit root -		
<u>Augmented Dickey-Fuller test statistic</u>	<u>-4.312714</u>	0.0025

Time series regression equation for the study:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \varepsilon_t$$

Time series regression model for this research :

$$CAR_t = \beta_0 + \beta_1 GDPA_t + \beta_2 CPI_t + \beta_3 EXR_t + \beta_4 LINR_t + \varepsilon_t$$

CRAR is capital to risk weighted assets ratio

GDPA is annual gross domestic product rate

CPI is consumer price index for inflation

EXR is exchange rate of rupees in one \$

LINR is lending interest rate

$\beta_0$  is the intercept value . $\beta_1, \beta_2, \beta_3, \beta_4$  are the coefficients and  $\varepsilon_t$  is the error term.

**Table: 3**  
**Regression results for capital adequacy ratio:**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21.70581	3.189537	6.805318	0.0000
GDPA	-0.020290	0.100678	-0.201533	0.8421
CPI	0.046947	0.013941	3.367516	0.0028
EXR	-0.146337	0.056060	-2.610378	0.0160
LINR	-0.493141	0.126745	-3.890828	0.0008
R-squared	0.711032	Mean dependent var		12.15222
Adjusted R-squared	0.658492	S.D. dependent var		1.652165
S.E. of regression	0.965503	Akaike info criterion		2.933240
Sum squared resid	20.50831	Schwarz criterion		3.173210
Log likelihood	-34.59875	Hannan-Quinn criter.		3.004596
F-statistic	13.53325	Durbin-Watson stat		2.375464
Prob(F-statistic)	0.000010			

The value of constant is 21.70581 which indicate that if GDPA, CPI, EXR and LINR are remain constant, then the value of capital adequacy ratio will increase by 21.70581 %. The coefficient value of 0.020290 means that if GDPA variable in this research is increased by 1%, capital adequacy ratio will decrease by 0.223%. The coefficient value of 0.046947 indicates that if consumer price index variable in this research is increased by 1%, capital adequacy ratio will change by 0.046947%. The coefficient value of 0.49 means that if lending interest rate the research is increased by 1%, capital adequacy ratio will change by 0.049. P- Value of F-statistics is less than 5 % hence GDPA, CPI, EXR, LINR can jointly influence the value of CRAR. Value of R-square is 0.711032 indicates that 71% of the variation in CRAR is caused by these macroeconomic variables.

**Table: 4**  
**Serial Correlation LM Test**

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.615041	Prob. F(2,20)	0.5505
Obs*R-squared	1.564394	Prob. Chi-Square(2)	0.4574

**Table: 5**  
**Breusch- Pagan Godfrey Test for Heteroskedasticity**

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

F-statistic	2.015839	Prob. F(4,22)	0.1273
Obs*R-squared	7.241727	Prob. Chi-Square(4)	0.1237
Scaled explained SS	4.703324	Prob. Chi-Square(4)	0.3191

**Table: 4** shows the results of Breusch-Godfrey serial correlation test which indicates that there is no serial correlation found in the model because p- value in the above table is more than 5 % hence we cannot reject the null hypothesis. The null hypothesis is that there is no serial correlation exists which is considered good fit for the model. **Table 5** shows that there is no Heteroskedasticity in the model.

**Table: 6**

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
GDPA does not Granger Cause CRAR	135	1.53710	0.2394
CPI does not Granger Cause CRAR	135	5.32539	0.0140
EXR does not Granger Cause CRAR	135	3.88464	0.0376
LINR does not Granger Cause CRAR	135	9.97106	0.0010

Table: 6 shows Pairwise results for Granger Causality test. The statistical results assert that consumer price index, exchange rate and lending interest rate Granger cause CRAR but GDPA does not Granger cause CRAR because p value for GDPA is more than 5%. Hence the null hypothesis can not be rejected. P-value in the case of CPI, EXR and LINR is less than 5% thus null hypothesis of no Granger cause to CRAR can be rejected.

**Table: 7****Johansen Cointegration test**

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.705268	88.58002	69.81889	0.0008
At most 1 *	0.670132	58.03777	47.85613	0.0042
At most 2 *	0.563874	30.31120	29.79707	0.0436
At most 3	0.284040	9.565602	15.49471	0.3156
At most 4	0.047336	1.212313	3.841466	0.2709

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

Table: 7 shows test results for Johansen cointegration test for existence of cointegration among the variables. Trace statistics indicates 3 cointegration equations among the variables hence there is existence of long term relationship among the variables. This is also clear from the F-Bound test as value of F-statistics( 9.796623) is more than the critical values of lower and upper bound.

**Table: 8 Bound Test**

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.796623	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Asymptotic: n=1000

**Table: 9 ARDL Model**

Selected Model: ARDL(1, 0, 0, 0, 1)

Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
CRAR(-1)	-0.146543	0.157224	-0.932060	0.3630
GDPA	-0.145571	0.090798	-1.603239	0.1254
CPI	0.053369	0.013501	3.953054	0.0009
EXR	-0.227806	0.053349	-4.270134	0.0004
LINR	-0.288630	0.121477	-2.376013	0.0282
LINR(-1)	-0.533350	0.134759	-3.957798	0.0008
C	31.60525	4.584263	6.894292	0.0000

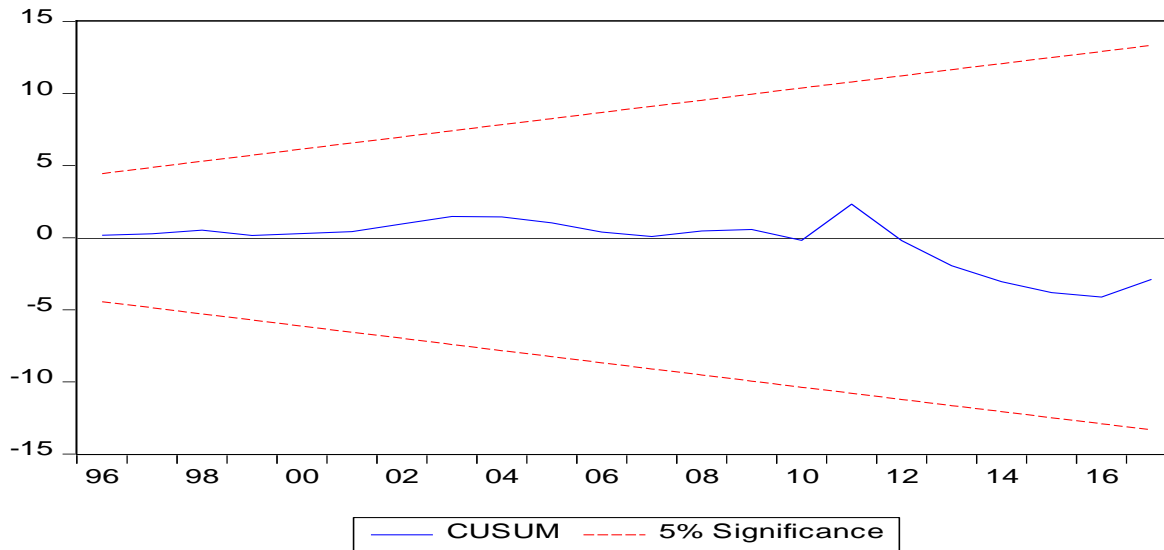
  

R-squared	0.840247	Mean dependent var	12.23885
Adjusted R-squared	0.789799	S.D. dependent var	1.621151
S.E. of regression	0.743260	Akaike info criterion	2.469263
Sum squared resid	10.49628	Schwarz criterion	2.807982
Log likelihood	-25.10042	Hannan-Quinn criter.	2.566802
F-statistic	16.65562	Durbin-Watson stat	1.927287
Prob(F-statistic)	0.000001		

The result of ARDL approach confirms the existence of long term relationship between CRAR and macroeconomic factors such as GDPA, CPI, EXR and LINR. The probability value of LM test and Breusch-Pagan – Godfrey for Heteroskedasticity confirms homogeneity of the time series data and CUSUM square confirms the stability of the model as the dotted line exists between the critical region at 5% level of significance. The cumulative sum of recursive residuals represents that coefficient of the long run lies within the critical range. The value of Durbin Watson stat also is close to 2 which indicate no autocorrelation in the model.

**Figure 1**

**Plot of cumulative sum of Recursive Residuals**



**FINDINGS OF THE STUDY:**

According to the statistical test results CPI inflation index, exchange rate and lending interest rate have a strong influence on capital adequacy ratio while the analysis results of GDP annual growth rate are not found significant for determining the capital adequacy ratio. CPI inflation rate has positive relationship with CAR which states that if inflation rises than capital adequacy requirements of the banks will increase. High inflation increases uncertainty in the economy thus banks lead to have more capital requirements. These results are in line with the studies of Abba et. al. (2013) and Yahaya et. al(2016). Exchange rate has negative relationship with capital adequacy ratio. If value of Indian Rupee to US Dollar declines then capital adequacy requirements will increase. Lending interest rate also has negative relationship with capital adequacy ratio which states that if lending interest rates declines then capital adequacy ratio requirements will increase. The statistical results that for Granger Causality test asserts that consumer price index, exchange rate and lending interest rate Granger cause CRAR but GDPA does not Granger cause CRAR. It is clear from the Johansen cointegration results and F Bound test statistics that CRAR, GDPA, CPI, EXR, LINR have long run relationship.

**RECOMMENDATIONS AND CONCLUSION:**

The present study concludes that CRAR is determined by macroeconomic variables such as GDPA, CPI inflation rate, exchange rate and lending interest rate. The Indian schedule commercial banks should be more aware and efficient in managing the macroeconomic environment that affect capital adequacy ratio. The robustness of a bank is depended on the value of capital adequacy ratio. The study recommends that Indian schedule commercial banks should adopt sound risk-management system and a risk-based capital maintenance mechanism that can analyze the sensitivity of macroeconomic changes and their impacts on capital adequacy requirements. The study also recommends development in operational performance of banks, with strict compliance of RBI regulations for capital requirements subject to macroeconomic indicators.

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