

MACRO DETERMINANTS OF CAR IN INDIAN BANKING SECTOR

Abhay Pant

Ganesh Kumar Nidugala

Indian Institute of Management, India

ABSTRACT

Banks as a channel of monetary policy transmission play a very important role in facilitating the process of credit creation in an economy. It is crucial for financial stability that banks stay financially healthy. Capital Adequacy Ratio is an important indicator of banks financial health. By nature, the banking-operations and performance are subject to business cycles and fluctuations in economic activity. The global financial crisis saw the failure of financial sector giants like Lehman Brothers and banks in the U.S.A and other countries. The spread of global financial crisis worldwide attracted the interest of academicians and policy makers in banking sector and its soundness. Thus, after the financial crisis of 2008 the research on banking sector particularly Capital Adequacy Ratio has gained lot of attention worldwide. This paper attempts to investigate and evaluate the impact of Macroeconomic Indicators on Capital Adequacy Ratio for Indian banks. The primary purpose of this paper is to evaluate the impact of external determinants on Capital Adequacy Ratio of Indian banks. We have used dynamic panel data analysis on 65 banks from 2007-2013. Our estimation based on Generalized Method of Moments reveals that Real GDP Growth, Inflation rate, Interest rate and Exchange rate have strong impact on Capital Adequacy Ratio of Indian Banks.

JEL classification codes: G2, G21

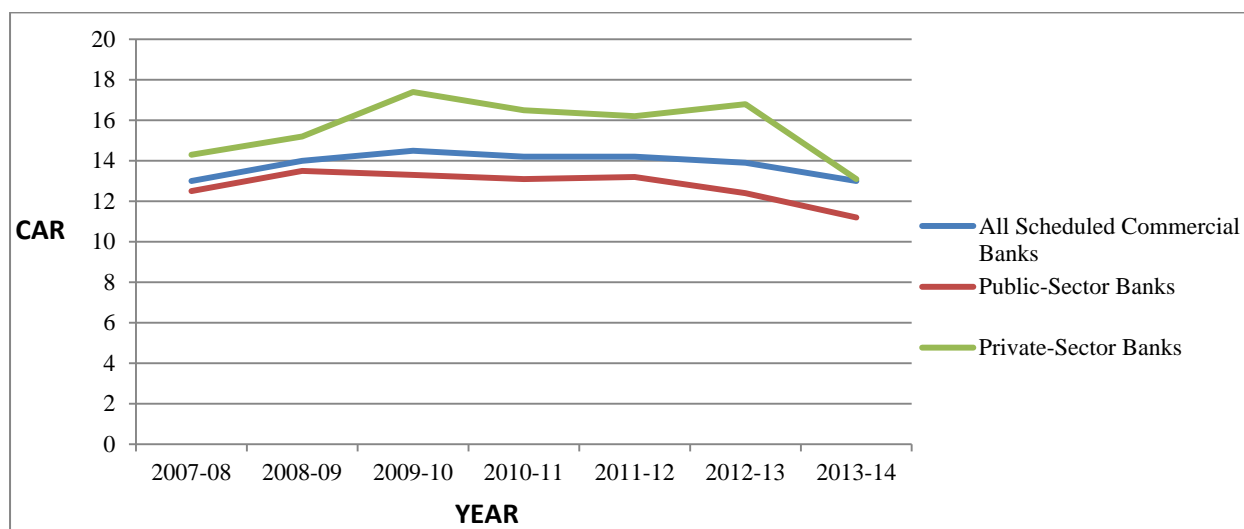
Key words: Capital Adequacy Ratio, Macroeconomic Indicators, panel data analysis, Generalized Method of Moments, Indian banks.

Corresponding Author's Email Address: f14abhayp@iimidr.ac.in

INTRODUCTION

As defined by Reserve Bank of India "Capital to risk weighted assets ratio is arrived at by dividing the capital of the bank with aggregated risk weighted assets for credit risk, market risk and operational risk".¹ This ratio shows the bank's risk absorption capacity arising out of its investment portfolio. The global financial crisis of 2008 rekindled the research in banking sector particularly its profitability and CAR. The bankruptcy of Lehman Brothers and the collapse of big investment banks in United States of America prompted countries across the world to restructure their banking systems. India with its robust banking sector and protectionist policies survived the aftermath of this crisis without a single case of bankruptcy. The requirement of CAR for banks is recommended by Bank for International Settlements (BIS) in Switzerland. The mandatory requirement of 8-% CAR in Basel 2 for banks was adopted by economies worldwide. In India, Reserve Bank of India went further and has dictated the requirement for 9 % CAR for banks. With the release of Basel 3 guidelines and its adoption by banks worldwide the increased CAR requirement of 10.50 % for all banks has become an inevitable statutory requirement. Australia, Canada, China, Singapore, Japan, Brazil and Switzerland are some countries adopting Basel 3 guidelines where Regulatory Consistency Assessment Programme (RCAP) assessments have been completed by Basel Committee on Banking Supervision (BCBS).² The deadline mandated by Reserve Bank of India (RBI) for maintaining CAR requirement under Basel 3 for Indian Banks is 2019. Thus, Indian Banks would now be required to maintain higher CAR of 11.5 % as against existing norm of 9% under Basel 2.³

FIGURE 1. THE TREND IN CAR OF BANKS IN INDIA



Source: RBI, Capitaline

Lower CAR reflects higher risk for the banks. The capital adequacy ratio data of Indian banks reveal some interesting insights. The Capital Adequacy Ratio of all scheduled commercial banks in India ⁴ has shown a decline from 14.5-% in 2009-2010 to 14.2-% in 2011-2012, further to 13.9-% in 2012-2013 and to 13.0-% in 2013-2014. The situation is worse for public sector banks. The CAR of public sector banks has decreased from 13.3-% in 2009-2010 to 11.2-% in 2013-2014.⁵ Therefore it becomes imperative to look at the determinants of capital adequacy ratio for Indian Banks. The two broad categories of determinants of capital adequacy ratio for banks are bank-specific determinants and the macroeconomic determinants. Our detailed analysis of literature below shows that bank-specific determinants have been thoroughly explored but not much research has been devoted to the macroeconomic part. This paper empirically investigates the link between CAR for Indian banks and the macroeconomic indicators for the period 2007-2013. Findings of the study have meaningful policy implications.

LITERATURE REVIEW

Considering the important role of banking regulation in U.S.A, Blum & Hellwig (1995) examined the relationship between banks CAR and macroeconomic indicators and concluded that these indicators affect banks capital adequacy ratio. Using theoretical macroeconomic model based on IS-LM goods and money market equilibrium, authors find out that macroeconomic variables affect bank's ability to meet its obligations and also significantly explain the fluctuations in capital adequacy ratio. Banking sector performance is one of the most widely researched areas in the banking sector. Reynolds, Ratanakomut & Gander (2000) examined the relationship between financial structure variables and bank performance. Using multiple regression technique authors studied and evaluated the financial structure and bank performance in 8 Asian and Southeast Asian nations.⁶ The study period of their research is from 1987 to 1997. The performance variables used in the study are profitability, capital adequacy ratio, liquidity, and loan preference. The bank-specific variables considered in the study are bank assets, time, administrative expenses and net income. The empirical results of their study demonstrated bank size as a significant determinant which was inversely related to the CAR implying large banks have smaller CAR and vice versa. Profit had a direct and significant relationship with the CAR of banks.

Saunders (2002) points out that macro risk may force banks to maintain higher capital adequacy ratio. The author argues that banks can increase their capital adequacy by increasing their investment in assets with higher expected earnings like loans. Babihuga (2007) investigated the linkage between macroeconomic variables and financial soundness indicators (FSI) of banks.⁷ Using dynamic panel data for 96 countries between 1998 to 2005 author tried to empirically examine the relationship between bank's financial soundness and macroeconomic indicators.⁸ For capital adequacy ratio and macroeconomic linkage, author employed the GMM technique⁹ and found that business cycles, one period lag of CAR, inflation rate, GDP growth rate, real effective exchange rate, and size were significant determinants of CAR.

Asarkaya & Ozcan (2007) analyzed the determinants of CAR for banks in Turkey. The study used GMM technique on panel data of Turkish banks from 2002 to 2006. The findings of the study revealed that lagged

capital, portfolio risk, average capital level, GDP growth, and return on equity were positively related to CAR while share of deposits affected CAR negatively. Akhter & Daly (2009) also studied the linkage between Financial Soundness Indicators and macroeconomic variables. The primary purpose of this paper was to examine how the health of banks varies with the macro indicators of an economy. CAR and profitability were the two important financial indicators in this study. Using panel data regression from 1998 to 2006 authors found out that GDP growth, inflation and real effective exchange rate influence bank's CAR negatively. The effect of interest rate on CAR was not found to be that robust and significant.

Bokhari & Ali (2012) analyzed the determinants of CAR of banks in Pakistan. The analysis was conducted using Correlation Analysis and Generalized Least Squares (GLS) regression technique on panel data for banks from 2005 to 2009. The results of correlation analysis revealed that the share of Deposits in non-equity liabilities and Return on Equity were significant factors negatively affecting CAR for banks in Pakistan. The regression analysis showed the share of deposits and portfolio risk as significant factors negatively affecting the CAR of banks in Pakistan. GDP growth didn't turn out to be a significant factor in their study. Ogege & Williams (2012) investigate the linkage between banks capital adequacy ratio and macroeconomic indicators for Nigerian economy. Using Co-integration and Error correction mechanism they find money supply, real domestic interest rate, and real exchange rate as important determinants of CAR in Nigerian banks.

Abusharba, Triyuwono, Ismail & Rahman (2013) evaluated the determinants of CAR in Indonesian Islamic commercial banks. Their study covered the period from 2009 to 2011. Using multiple regression technique, authors find Profitability (ROA), Liquidity (FDR) and Asset Quality (NPF) as significant determinants of CAR in Indonesian Islamic commercial banks. While the study found ROA and FDR to be positively significant, NPF was found to be negatively significant in their study.¹⁰ Aktas, Acikalin, Bakin & Celik (2015) tried to examine the determinants of Capital Adequacy Ratio of banks in South Eastern European countries. Using Generalized Least Squares (GLS) panel data regression for 71 commercial banks from 2007-2012 in 10 different countries within South Eastern European region authors found that size, return on assets, liquidity, leverage, net interest margin and risk were important bank specific determinants of CAR in SEE region. Among environmental factors GDP growth rate, Euro Zone Stock Index, Insurance Coverage, and Governance were found to be significant factors influencing CAR.

Klepaczarek (2015) examined the determinants of Common Equity Tier 1 ratio (CET1)¹¹ for European banks. The research was conducted using financial and macroeconomic data from 22 European countries for 49 banks. Using Ordinary Least Squares (OLS) regression for the European banks in 2013 author finds risk-weighted assets to total assets ratio, loans to total assets ratio, average CET1 ratio, asset size and deposits to nonequity liabilities ratio as significant factors affecting CET 1 ratio. Mekonnen (2015) attempted to examine the determinants of CAR for commercial banks in Ethiopia. The time period of this study is from 2004 to 2013. Using fixed effects regression model for 8 banks in the sample author finds return on assets (ROA), return on equity (ROE), bank size, deposit ratio, and net interest margin as significant determinants of CAR for Ethiopian banks. While the coefficients of ROA, deposit ratio and size were found to be positive and significant, those of NIM and ROE were negative and significant in this study.

Shaddady & Moore (2015) investigated the determinants of CAR for banks in Gulf Cooperation Council (GCC). Using panel data regression for 89 banks in GCC they evaluated the impact of bank specific, macro and market contestability indicators on CAR. The study period of this research is from 1998 to 2013 where authors have also examined the impact of global financial crisis on banks CAR in GCC region. For the impact of bank-specific variables on CAR their results show that loan loss provisions (LLP), current ratio, and return on average assets (ROAA) have a positive significant impact on CAR while bank size, leverage ratio and risk weighted assets have a negative and significant effect on CAR. Among the macroeconomic variables GDP growth rate, money supply, real effective exchange rate, inflation rate, interest rate and oil prices came out significant in the study. The macro variables were significant based on GMM technique used for dynamic panel data analysis. While GDP growth rate, inflation rate, money supply, interest rate and oil price were all negatively significant real effective exchange rate had a positive impact on CAR. For market contestability indicators the impact of conglomerates on CAR was found to be negative while the impact of entry requirements and restriction of activities was found to be positive and significant.

This paper is explicitly concerned with macroeconomic indicators and financial soundness linkage as this has not received much attention in the existing literature. Our review of the literature on bank's CAR reveals that there are limited number of studies that investigate the impact of macro-economic indicators on bank's capital adequacy ratio. To the best of our knowledge there are no studies for India which consider the impact of macroeconomic factors on CAR.

OBJECTIVES OF THE STUDY

Macroeconomic variables are considered to be the important external determinants of bank's profitability. Internal bank-specific determinants of capital adequacy include bank profitability, net interest margin, bank size etc.

Most of the studies reviewed have considered relationship of bank specific variables with CAR. Macroeconomic determinants were kept as control variables in some of the studies that investigated the determinants of bank's capital adequacy ratio.¹² While macroeconomic determinants may play a significant role, the studies on direct linkage between CAR and macroeconomic indicators are limited, particularly in Indian context. With a view to fill in this research gap, the objective of our study is to investigate the impact of important macroeconomic variables on bank's CAR in India

METHODOLOGY

We use data relating to Indian banks from 2007 to 2013. The rationale for choosing this period is as follows: Firstly, it is driven by our motivation for research as our dependent variable CAR has shown downward trend after 2007 indicating that financial health of Indian banks is deteriorating. Secondly, post the global financial crisis of 2007 most of the economies have experienced economic slowdown, rising debt levels as countries tried to spend their way out of recession and heightened risks for banks. India is no exception to this. Hence, we used data from 2007, 2013 being the most recent year for which we have data was available for all the variables chosen at the time of the study. We seek to identify the macroeconomic determinants which may explain this falling CAR for Indian banks. The data is a panel data set containing elements of both time series and cross-section items. Our panel data is balanced in nature as we don't have any missing values for any variables in our study. The data on bank-specific variables are collected from CMIE Prowess database, and any missing value is filled from the data in RBI database.

We employed Generalized Method of Moments technique on balanced panel data for commercial banks in India. The rationale for using GMM is motivated by the fact that our model may encounter endogeneity problem of exogenous variables. Endogeneity problem arises when the error term in the model is correlated with the independent variables in the model. If this exists then the regression coefficients for Ordinary Least Squares (OLS) regression are biased. Thus considering the above issues and the dynamic nature of CAR we used GMM. The dependent or endogenous variable is CAR and the explanatory variables are macro variables: real GDP growth rate, interest rate, inflation rate, money supply, real effective exchange rate and foreign direct investment. Bank specific variables like profitability, net interest margin and bank size are all control variables in our study.

We have considered commercial banks that are homogenous in their operations of accepting deposits for the purpose of lending and investment. We have considered 65 banks for which data was available on consistent basis for the chosen period. The data included State bank of India and its associates, other public sector banks, private and foreign Banks. We formed a balanced panel and used multiple regression analysis to estimate the impact of explanatory macroeconomic variables on capital adequacy ratio of banks in our sample. We formed the following empirical econometric model: -

$$CAR_{it} = \beta_0 + \beta_1 CAR_{it-1} + \beta_2 GDP_{it} + \beta_3 IR_{it} + \beta_4 CPI_{it} + \beta_5 MS_{it} + \beta_6 ER_{it} + \beta_7 FDI_{it} + \beta_8 ROA_{it} + \beta_9 NIM_{it} + \beta_{10} BS_{it} + e_{it} \quad (1)$$

The choice of control variables in our study is based on the existing literature.¹³ The rationale for choosing the macro-variables is also based on the existing literature and our understanding of important macroeconomic variables that might affect CAR of banks in India. The subscript i denotes the cross-sectional units which are banks and the subscript t captures the year of time series. CAR is the capital adequacy ratio of banks. CAR is calculated as the ratio of bank's capital to its risk-weighted assets. The numerator capital comprises of both Tier 1 and Tier 2 capital. It includes core as well as the supplementary capital. β_0 is the intercept. Remaining beta values are the slope coefficients of the stated explanatory variables in our model. GDP is the real growth rate in Gross Domestic Product based on constant prices. IR is the Interest rate for which we have taken Repo rate as the proxy. Repo rate is the repurchase rate at which commercial banks borrow from the central bank. It is the rate at which RBI infuses liquidity into the system. Inf refers to the Inflation based on consumer price index measured as annual percentage change.

MS refers to the money supply. Money Supply comprises of the currency and the deposits. We have taken M3 (broad money) as our proxy of money supply. ER is the exchange rate and for this we have taken Real Effective

Exchange Rate.¹⁴ FDI is the net foreign direct investment in the economy. ROA is the return on assets calculated as the ratio of profit after tax to total assets. NIM is the net interest margin calculated as the ratio of interest income by total assets. BS is the bank size calculated as the log of total assets for a bank. All the above three bank specific variables are the control variables in our study.

Hypothesized Relationship between CAR and Explanatory Variables

Based on literature and our theoretical understanding, we expect the following signs for our macro-economic variables: -

We test the hypothesis that the real GDP growth rate has a negative effect on the bank's Capital Adequacy Ratio. During the high growth period, banks capital adequacy ratio is low so that they can take advantage of growth opportunities. Similarly, during downturn or recessions bank tend to work with higher Capital Adequacy Ratio so as to take care of their higher risk levels (Bokhari et al, 2012).

H1- Real GDP growth rate has a negative impact on bank's CAR in India

The effect of interest rate on CAR is ambiguous as it can have a positive or negative impact on CAR. An increase in interest rate can reduce the lending capacity of banks as they would now face a lower risk. Thus banks would prefer to hold lower CAR because of the reduced risk. On the other hand, a decrease in the interest rate may increase the lending capacity of the banks that may prefer to hold tighter CAR because of the increased risk of lending (Cecchetti & Li, 2008).

Banks that have large obligations suffer with the high interest rate as their earnings may reduce because they have to serve more debts, so banks may hold lower CAR (Shaddady & Moore, 2015). A high lending rate may also increase banks earnings, increasing the numerator capital in CAR provided the deposit rates are not changed at the same time which could adversely affect the profitability of banks (Akhter & Daly, 2009). We expect that interest rate has a negative effect on CAR.

H2- Interest rate has a negative effect on bank's CAR in India

The effect of inflation on CAR is ambiguous and it depends on the bank's income during the periods of high inflation (Bahihuga, 2007). For example, if the income of the bank goes down due to inflation, the retained earnings and reserve positions will also go down decreasing the numerator, capital, in our dependent variable (CAR). During the periods of high inflation investors expect to earn more. Banks may thus meet investor expectations rather than holding high CAR (Akhter & Daly, 2009). High inflation leads to the reduction in real rate of returns on bank assets, decreasing the quantity of bank assets and the credit risks. A reduction in the credit risk of the banks leads to an increase in the CAR as the denominator term in CAR reduces. Therefore, high inflation implies greater capital adequacy ratio for banks.

A high inflation rate would imply greater uncertainty which may lead to an increase in the Common Equity Tier (CET) 1 ratio Klepczarek (2015). Thus, an increase in CET1 ratio would increase the CAR of banks. Ogere, Peter & Inyang (2013) explored the relationship between capital adequacy ratio and banking risk in Nigeria. Using panel data regression on Nigerian banks from 2007 to 2011 authors find that inflation affects CAR positively while deposit asset ratio and risk weighted assets ratio influence it negatively.

H3- Inflation rate has a negative effect on bank's CAR in India

We expect the coefficient of money supply to be negative. The reason being that higher money supply reduces the public incentive to borrow money from banks. As a result, the lending of banks may come down, reducing their risk and the capital adequacy ratio (Shaddady & Moore, 2015).

In Indian banking sector M3 is more suited as a proxy of broad money supply and hence we use M3.¹⁵

H4- Money Supply has a negative effect on bank's CAR in India

The effect of real exchange rate on bank's capital adequacy ratio has also been inconclusive, and it depends on the share of banking system assets held abroad (Bahihuga, 2007). An increase in the real exchange rate may reduce the foreign direct investment in the region thereby reducing the Capital Adequacy Base (Ogege, Williams & Emerah, 2012). An increase in the REER implies appreciation of the domestic currency. The appreciation of the domestic currency results in loss in trade competitiveness as exports become more expensive. Thus, banks with relatively large foreign shares and assets may experience a loss in capital adequacy

ratio while the banks with lesser foreign shares and obligations will have higher CAR. On the other hand, a decrease in REER would mean the depreciation of the domestic currency. Hence the banks with relatively larger foreign assets are likely to have a greater CAR because of the increased foreign investments in that region and the ones with low foreign shares and assets will have lower CAR. In this study, we expect the positive sign of the coefficient of real effective exchange rate (RERR).

H5- Real effective Exchange Rate has a positive impact on bank's CAR in India

An increase in the real exchange rate may reduce the foreign direct investment which may lead to the reduction in the Capital Adequacy Base (Ogege, Williams & Emerah, 2012). We expect a positive coefficient of foreign direct investment in our study. An increase in foreign direct investment increases the employment and output. This would again lead to an increase in income of the people that they will prefer to keep in the safety vaults of banks. The capital of banks would increase which would increase their capital adequacy ratio.

H6- FDI has a positive impact on bank's Capital Adequacy Ratio in India.

TABLE 1. SUMMARY TABLE OF VARIABLES AND HYPOTHESIZED RELATIONSHIP

Variables	Theoretical predictions/ Empirical Literature	Hypothesized relationship for the current study
Real GDP Growth	Negative(-)	Negative(-)
Inflation (CPI)	Ambiguous	Negative (-)
Money Supply(M3)	Negative(-)	Negative(-)
Interest Rate(Repo Rate)	Ambiguous	Negative(-)
Exchange Rate	Ambiguous	Positive (+)
Foreign Direct Investment	Positive (+)	Positive (+)

SOURCES OF DATA

The data for macroeconomic indicators are collected from RBI Database on Indian Economy and World Bank dataset. The data on macroeconomic variables are same for all the banks in our sample. Bank specific data on capital adequacy ratio is collected from CMIE Prowess database. The data for control variables in our study are bank size, net interest margin and return on assets which were also retrieved from CMIE Prowess. The missing data values of CAR and bank specific control variables in our study are filled from RBI database. Our data is a panel data from 2007 to 2013 which is balanced in nature meaning we don't have any missing values.

DATA ANALYSIS

The first issue in our analysis is the choice between the random effects and fixed effects model. We expect bank-specific effects in our model. The choice between the two models was made through the use of Hausman test. If the probability value in the test result is less than 0.05 we use the fixed effects model. Neither fixed effects nor the random effects fitted our data well since our variables are dynamic in nature. Due to space constraint the results of fixed and random effects model have not been presented in the paper but will be provided on request. Banking sector in itself is a very dynamic sector meaning that it is not static and changes frequently with the changes in its determinants. The dynamism of banking sector comes from the fact that it continuously evolves and adapts to the changes in the regulations, policy and economic factors.

Therefore, considering the nature of variables in our study we used GMM popularized by Arellano and Bond (1991), and Blundell and Bond (1998) for dynamic panel data analysis. Our model can also have bidirectional causality where CAR of banks may also drive the macroeconomic performance. Our dependent variable CAR is largely dynamic in nature. The dynamic nature of CAR is captured through the lagged value of CAR in our model. The dynamic nature based on behavior of CAR implies the presence of autoregressive process in our model.¹⁶ GMM has better asymptotic properties that fit dynamic panel data analysis very well.

Our model considers three important estimation issues. For individual bank-specific effects the first differences are taken for the variables in the model. The dynamic nature of our dependent variable CAR is taken care of through first difference of dependent variable. The endogeneity of independent variables is an important issue. The model takes care of this by applying instrumental variables which are based on lag values of exogenous variables in the model.

For our endogenous variable we use a one period lag of capital adequacy ratio. The reason for using one period lag is based on the fact that due to bank regulation there might be the time invariant behavior of statutory CAR requirement. The lagged value of dependent variable also controls for the persistence or mean reversion of the CAR in our model. Thus by using one period lag of CAR we may be better able to capture the impact of macroeconomic indicators on banks CAR. We don't consider higher order lags of CAR in our model as we believe that these might already capture the impact of macroeconomic variables and in that case our results would not be that robust.¹⁷ We use the two step GMM method for our panel data analysis. We have considered two cases in our analysis. In the first case we have used only the difference equation with the instrumental variables which takes care of the endogeneity. In the second case we consider the system GMM based on level variables.

The rationale for using both difference and level equation is to arrive at system estimators. System estimators combine the moment conditions of difference as well as level equations. The rationale for using system GMM over Differenced GMM and level GMM is based on the fact that it provides a greater system of equations with an approach that gives us more suitable instruments. Using many instruments improve the efficiency of GMM estimators. Thus, system GMM estimators are more efficient compared to Differenced GMM.

TABLE 2. REGRESSION RESULTS

Variables	Coefficient	z value	P≥ z
CAR _{t-1}	0.624	137.14	0.000*
GDP	-0.143	-2.15	0.032*
CPI	-0.470	-2.92	0.004*
IR	-0.902	-2.28	0.022*
ER	0.308	2.23	0.026*
FDI	0.755	0.61	0.544
ROA	0.004	0.56	0.573
NIM	-0.004	-0.66	0.511
BS	-1.16	-21.31	0.000*
Observations	390		
Number of id	65		
Wald Test	180693.53*		
AR(1) p value ¹⁸	0.024		
AR(2) p value	0.607		
Sargan test ¹⁹ (p value)	0.196		

The dependent variable is the Capital Adequacy Ratio. CAR_{t-1} captures the dynamic nature of Capital Adequacy Ratio. *indicates significant at 5 % level of significance and ** indicates significant at 10% level of significance.

The overall Wald Chi square probability value is also significant in our model indicating that our model is reasonably well fitted. The control variable Bank size turned out to be significant with p value less than five percent level of significance. The lag of endogenous CAR is also significant in our model. As shown in the results table Money supply was dropped out from our model because of the collinearity issue.²⁰ As mentioned we hypothesized a negative coefficient for GDP growth rate. Our analysis also reveals that a unit increase in GDP growth rate decreases bank's capital adequacy ratio by 0.143 units. As hypothesized we find a negative coefficient for interest rate in our analysis meaning an increase in interest rate by one unit decreases bank's capital adequacy ratio by 0.902 units. The effect of inflation on CAR of banks is ambiguous as it depends on banks income during the periods of high inflation. Inflation can have a positive or negative effect on CAR. We find that inflation has a negative impact on bank's capital adequacy ratio in India. The negative coefficient for

inflation shows that a unit or percentage increase in Inflation, decreases the bank's capital adequacy ratio by 0.470 units. The effect of real effective exchange rate on CAR of banks is ambiguous as it depends on banking system assets held abroad. Real effective exchange rate can have a positive or negative effect on CAR. As hypothesized we find a positive coefficient of real effective exchange rate meaning that an increase in real effective exchange rate by one unit increases banks CAR by 0.308 units. Our model shows a positive coefficient for foreign direct investment but it is a non-significant variable in our regression results. As evident in our analysis falling CAR is consistent with our negative coefficient of GDP growth rate, Inflation rate and the Interest rate. An increase in GDP growth rate, inflation rate and interest rate decreases CAR for Indian banks. Though the effect of exchange rate is positive we argue that the negative impact of GDP growth, inflation rate, interest rate and bank size on CAR is one of the reasons for its steep fall since 2008 onwards for all scheduled commercial banks in India. The effects of these variables could dominate the positive impact of real effective exchange rate on CAR. Thus macroeconomic variables have played a significant role in explaining the falling CAR for Indian banks. However, we need to look at more variables with large data points to come to a conclusion.

Our results show that macroeconomic indicators like GDP growth rate, Inflation rate, Interest rate and Exchange rate are significant determinants of bank's CAR in India for the study period. Apart from the bank-specific factors policy prescriptions should also take into consideration the effects of macroeconomic indicators for the banking sector. The financial deepening and soundness of banks to a large extent depend on the state of the economy. Our review of existing literature on capital adequacy ratio reveals that the effect of macroeconomic indicators on bank's capital adequacy ratio has been ignored. Banking Sector plays a very crucial in the economy by connecting borrowers to savers and facilitating the credit creation process. Therefore, a narrow policy focus on bank-specific factors is not sufficient as the state of the macro-economy as indicated by the macroeconomic indicators plays a very crucial role in explaining the bank's Capital Adequacy Ratio.

LIMITATIONS OF THE STUDY

This study attempts to investigate the impact of macroeconomic indicators on Bank's Capital Adequacy Ratio in India. Using a balanced panel data set for 65 banks in India we try to empirically estimate this relationship. One of the major limitations of this study is the availability of data on banks CAR for recent years. We conducted the analysis for six years from 2007-2013 as there was lot of missing data after 2013 onwards. We also didn't include Regional Rural Banks and the Cooperative banks in our analysis as we couldn't access their data. Other limitation of this research would be the limited number of control variables in our study. Bank's Capital Adequacy has large number of bank-specific determinants which we didn't include in our model. We took three main variables of size, profitability and net interest margin as control variables in our study. However, there could be other variables that may affect bank's CAR in India. The number of explanatory variables are also limited to six. We could include more macroeconomic variables in our model as an extension to this study.

CONCLUSION AND IMPLICATIONS OF THE STUDY

This paper tries to empirically evaluate the impact of macroeconomic indicators on Capital Adequacy Ratio of Indian banks. The main objective was to see how macroeconomic indicators affect the Banks Capital Adequacy ratio in India. We took the data for 65 commercial banks that are homogenous in their operations and then conducted the regression analysis. Our data is a balanced panel data set for 65 banks from 2007 to 2013. We have used dynamic panel data estimation technique based on Generalized Method of Moments as our dependent variable is dynamic in nature. The use of GMM technique also accounts for the endogeneity problem in the estimation of the model. We have also controlled for three major bank-specific determinants that can affect our dependent variable significantly. Our results indicate that Macroeconomic variables like GDP growth, inflation rate, exchange rate and interest rate are significant determinants of bank's CAR in India.

The findings of the study suggest that the policy prescriptions that focus on the bank-specific determinants of capital adequacy ratio should also appropriately account for the influence of macro-economic indicators. There were limited number of studies that empirically evaluated the direct connection between bank's financial soundness as given by CAR and macro-economic indicators of the economy. Policy makers and regulators like Reserve Bank of India should take into consideration the effect of macroeconomic variables on CAR while framing policies on CAR and monitoring banks. We also suggest some of the future areas of research in the next section.

FUTURE AREAS OF RESEARCH

Capital Adequacy Ratio is a dynamic concept which tells us about the financial soundness of a bank. A closely related concept is the asset quality of the banks. Asset quality is also an indicator of the financial soundness of a bank. It would be worthwhile to examine the impact of macroeconomic variables on the asset quality of banks. It appears to us that such a study may suggest strong policy implications. Some of the macroeconomic indicators like the inflation rate, interest rate and the exchange rate may have strong interaction between them. Studies make take into account such interaction effects also. Another important question would be to explore this interaction effect and its impact on bank's CAR, profitability and asset quality. The impact of global financial crisis on banks' capital adequacy ratio is also worth investigating. A cross country comparison of CAR for banks in other countries in the Asian region can also be investigated. It would be good to look at some of the above research questions as these would highlight significant implications not only for policy but also for practice.

ANNEXURE- RESULTS OF DESCRIPTIVE STATISTICS

TABLE 3- DESCRIPTIVE STATISTICS

Variables	Mean	Std.Dev	Min	Max	Obs
CAR	21.52	21.89	8.79	175.46	455
ROA	1.87	7.19	-3.12	131.96	455
NIM	3.8	12.13	0	261	455
BS	12.41	2.10	6.57	16.56	455
GDP	7.63	2.28	3.89	10.25	455
CPI	8.84	1.99	6.14	11.99	455
IR	6.96	1.26	5	8.5	455
MS	10.92	0.30	10.4	11.33	455
ER	106	4.56	99.65	112.68	455
FDI	6.6	0.38	5.86	6.99	455

ENDNOTES

¹ Source- <https://www.rbi.org.in/scripts/Glossary.aspx>, accessed on Jan 29, 2016

² Source-<http://www.bis.org/bcbs/publ/d299.pdf> accessed on Jan 30, 2016

³ Source- <http://www.livemint.com/Politics/FNAmjqBHmgzi94Pd94OdbK/RBI-extends-BaselIII-deadline-to-31-March-2019.html> accessed on Jan 30, 2016

⁴ Scheduled Banks- All banks that are included in the second schedule of the RBI Act, 1934 are scheduled banks. As given by RBI Scheduled Commercial Banks are classified into five categories which are State Bank & its Associates, Nationalized Banks, Foreign Banks, Private Banks and Regional Rural Banks.

⁵ Source- http://www.business-standard.com/article/finance/capital-adequacy-ratios-of-banks-hit-6-year-low-114090201012_1.html accessed on Jan 30, 2016

⁶ Countries in their research include Thailand, Singapore, Indonesia, Hongkong, Philippines, South Korea, Malaysia and Taiwan.

⁷ Financial Soundness Indicators as referred here are Capital Adequacy Ratio, Asset Quality and Profitability.

⁸ For name of the countries check appendix- Babihuga, Rita (2007). Macroeconomic and Financial Soundness Indicators: An Empirical Investigation, IMF Working Paper, WP/07/115

⁹ Author had used both Differenced and System GMM.

¹⁰ NPF is the Non Performing Financing which is the proxy for Asset Quality of banks. Return on Assets is considered as a proxy of profitability in banks. FDR is defined as the ratio of total financing to total deposits in a bank and is taken as a proxy for liquidity.

¹¹ Common Equity Tier 1 ratio is the ratio of core equity capital to the risk weighted assets of a bank. It is a widely known measure for the financial health of a bank.

¹² Aktas, R., Acikalin, S., Bakin, B., & Celik, G. (2015) evaluated the impact of bank specific and environmental factors on CAR of banks in South Eastern European Region. They considered external environmental factors like GDP growth rate, inflation, real interest rate, volatility index, governance, and insurance coverage as control variables in this study.

Bohachova (2008) attempted to explore the linkage between macroeconomic variables and bank risk for large sample of banks from Organization of Economic Cooperation and Development (OECD), Non OECD and European Union (EU) nations. His sample consisted of 24,202 observations with 4,931 banks from 120 countries. GDP per capita is kept as a control variable in this study.

¹³ Abusharba, Triyuwono, Ismail & Rahman (2013) studied determinants of CAR for Indonesian Islamic commercial banks. Profitability as given by ROA was found to be a significant factor.

Aktas, Acikalin, Bakin & Celik (2015) attempted to study determinants of CAR of banks in South Eastern European (SEE) region. The study found ROA as a positively significant factor and Bank Size as a negatively significant factor influencing CAR of banks in the SEE region. Net interest margin was found to have a significant positive effect on CAR of banks.

Mekonnen (2015) investigated the determinants of CAR for banks in Ethiopia. The study found Return on Assets(ROA) and Bank Size as the positively significant factors influencing CAR of banks in Ethiopia. Net Interest Margin was found to be a negatively significant factor. For reference see: - Mekonnen, Y. (2015). DETERMINANTS OF CAPITAL ADEQUACY OF ETHIOPIA COMMERCIAL BANKS. *European Scientific Journal*, 11(25), 315–331.

¹⁴ As defined by RBI- “The REER is the weighted average of Nominal effective exchange rate (NEER) adjusted by the ratio of domestic price to foreign prices”. “NEER is calculated as geometric weighted averages of bilateral exchange rates of domestic currency in terms of foreign currency”. An increase in the REER means that exports have become expensive and imports have become cheaper. Thus, an increase in REER results in loss in trade competitiveness. RBI publishes REER based on weights of 6 and 36 currencies. Our study includes REER based on consumer price index and comprises of trade weights for 36 currencies.
Source: <https://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/05ARB100414F.pdf> accessed on Feb 1,2016

¹⁵ M3- Currency with the public+ Demand deposits with the banking system + Other deposits with the RBI+ Savings Deposits of post office savings bank+ Time Deposits with the banking system

Source: <https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/78902.pdf> accessed on 30Jan, 2016

¹⁶ Autoregressive process implies that the output variable say Y depends on its values in the previous periods plus the random error term. For instance AR(1) would mean output variable say Y would depend on its one period lag plus the error term.

¹⁷ We conducted a bond test of autocorrelation for first differenced errors and found out that our first lag of CAR is significant so we need not use the higher order lags for CAR.

¹⁸ AR-1 and AR-2: - Arellano Bond test for autocorrelation in the first-differenced errors.

¹⁹ We tested for over identifying restrictions using Sargan test for over identifying restrictions in Stata. We got a p value of 0.196 which confirmed the validity of our instruments.

²⁰ The above mentioned table 2 and in the appendix section table 3 clearly show the regression results without MS variable which is dropped out due to multicollinearity problem. We have not separately found out the

Variance Inflation Factor (VIF) to determine multicollinearity but while using the dynamic panel data in Stata we selected the option of collinearity among levels of independent variables to take care of multicollinearity problem. Thus, MS was dropped out from the model.

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