



# Banking Risks and Economic Activity: An Emerging Market Perspective

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**Abstract:** The study empirically examined regulatory role of Basel Capital Accord in reflecting the solvency of commercial banks. The impact of bank specific risk variables and economic indicators on Capital Adequacy Ratio (CAR) of commercial banks of Pakistan was tested in panel data setup employing fixed and random effects modelling with annual data collected from 25 commercial banks for the period from 2007 to 2014. Credit risk and operational risk variables tested by the study showed significant statistical impact however, economic activity showed no statistical impact on Capital requirements of the commercial banks.

**Keywords:** Commercial banking, NPL, Credit Risk, Market Risk, Operational Risk, Basel Capital

**JEL Classifications:** G21, G28

## 1. Introduction

Episodes of economic crises have been argued to be rooted in financial capitalism and the role of banking in instigating economic crises peaked debate since global financial crisis of 2007-2009 (Aktan and Icoz, 2009; Rockoff 2010; Masood et. al., 2010; Pariente et al, 2011; Lapavitsas 2013). History of economic crises can be traced back to the economic slump caused by the financial crisis of 1772. The economic crash of 1772 and the recent global financial meltdown may be centuries apart but shared a similar trait, they marked end of periods of credit boom facilitated by banks. The importance of debate on the role of money and lending ability of banks was recognized as early as Adam Smith, although a blanket proponent of *laissez-faire*, reading into the financial crises of 1772<sup>1</sup>, agreed with requiring a government regulation of some sort on regulating banking, later on agreed by Friedman following his assessment of the crash of 1929<sup>2</sup>. In short, throughout the history of financial crises, literati continued attempts to understand and explain the geneses of economic growth and decay emerged with pioneering theories of free market<sup>3</sup>; money supply<sup>4</sup>; and capital accumulation<sup>5</sup>. Banking institutions, no doubt form an integral part of economic and political engineering due to systemic nature of their operations. For

1772 witnessed collapse of Ayr bank, the case of British credit crises that originated in London. The economic crises of 1772 followed Great Britain's industrial expansion throughout 1760's, an era of growth attributed to easy availability of cheaper capital to merchants, facilitated through banks. Once the availability of credit stopped, financial crises erupted see Sheridan (1960)

2. See Rockoff (2010). Parallel journeys: Adam Smith and Milton Friedman on the regulation of banking. *Rutgers University Department of Economics Working Papers*, (201004)

3. Adam Smith (1723-1790): *The wealth of nations* (1776).

4. David Hume (1711-1776)

5. Karl Marx (1818-1823)



instance, banks' inherent ability to facilitate credit creation and providing liquidity, once in a state of crisis can threaten the stability of entire financial system (Santos 2001). Despite operating in regulated environment banking institutions seemed to have made the most of financial growth opportunities. Banks, traditionally mediators in investing savers money, freely engage in open market trading as traders, gather fees and commissions where possible while facilitating financial transactions (Fouskas and Dimoulas 2013). Systemic importance of globally active banks is significantly influential on financial markets and that was crucially highlighted during instant spread of the global financial crisis of 2007-8 originated by the credit crunch. Global financial crisis of 2007-8 brought the role of central banks and regulatory framework developers in limelight as most burdened, emphasizing the fact that the role of Bank Capital Regulations and Supervision in correctly predicting financial risk taking of the entire banking segment carries immense importance<sup>6</sup>.

This research taking motivation from aforementioned, first of all contributes to country specific empirical studies of Basel Capital implementation and effectiveness of the banking regulations relating to policy making in developing economies. The study finds a research gap in empirical studies in fields of Basel banking regulations and risk management in developing countries and Pakistan. The study therefore contributes to empirical literature through undertaking statistical testing of the impact of banking risks and economic activity on the capital requirements of the commercial banks of Pakistan. The research devised unique proxies for Basel specified credit, market and operational risks in panel data setting for the commercial banks of Pakistan (Michalopoulos, Laeven and Levine 2009; Barth et al. 2010; Chortareas et al. 2012).

## 2. Previous Studies

There is plentiful evidence of varied shuffles of bank specific variables and economic indicators arranged in baffling sets of relationships in attempts to gauge the impact of the economic activity on banks' capital behavior. The bulk of the literature, owing to extensive research activity makes notable progress in China, Gulf, United Kingdom, Europe and Americas<sup>7</sup>. The literature on developing economies attempts to estimate impact of financial sector on economic activity in Pakistan<sup>8</sup>. However, research on role of commercial banks capital behavior in the economy for instance, remains well off-pace in addressing capital adequacy shortcomings<sup>9</sup>.

6. Credit crunch is defined as credit squeeze faced by lending institutions including Systemically Important Banks (SIB's). Collapse of SIB's due to credit default was at the heart of the global economic meltdown during 2007-8.

7. See Bouheni et al (2014); Messai and Jouini (2013); Klein (2013) for detailed discussion on Europe and Americas. Al-Khouri (2011) examined data of 43 commercial banks in the Gulf over the period 1998-2008 applying fixed effect model. Cai and Huang (2014) for China.

8. Pakistan is compliant with International Financial Reporting Standards (IFRS) under the organizing bodies of 'The Institute of Chartered Accountants of Pakistan' (ICAP) and 'Securities and Exchange Commission of Pakistan (SECP). Institute of Chartered Accountants of Pakistan (ICAP) regulates chartered accountants in Pakistan and standard setting body for Islamic Financial Accounting Standards. Securities and Exchange Commission of Pakistan (SECP) financial regulatory body that monitors accounting standards for all entities in Pakistan. SECP is member of International Organization of Securities and Commissions (IOSCO), International Association of Insurance Supervisors (IAIS), International Organization of Pension Supervisors (IOPS) and Corporate Registers Forum (CRF).

9. In Pakistan see contributions by Ali et al (2011) by way of descriptive statistics and regression for the period between 2006 and 2009; Akhtar and Nishat (2002) use of DEA; Usman (2010) studied impact of Global financial crises on Pakistan; Alam et al (2011) attempts to study Pakistan commercial banks financial performance.



The research therefore aims to extend existing research in the role of banking regulations and risk management in banks to determine limitations of capital adequacy of the commercial banks of Pakistan see Keeton and Morris (1987); Thakor (1996); Demirguc-Kunt and Detragiache (1998); Salas and Saurina (2002); Barth et al (2005); Ozturk and Aktan, (2007); Aktan, (2008); Khemraj and Pasha (2009); Laeven and Levine (2009); Demirguc-Kunt et al (2013).

Capital Adequacy Ratio (CAR) is regarded by the International Bank Capital Regulations and Supervision authorities as most important predictors of bank solvency, calculated as percentage of risk weighted assets. Larger minimum capital requirements by the banks would result in restricted operations of the banking sacrificing profitability and growth, whereas lower minimum capital requirements can be argued to allow banks to increase business investing in riskier positions (Wei 2011). The literature suggests that close monitoring and efficient management of capital of the banking institutions following Basel Regulations upholds the argument that banks with sufficient capital can lower cost of borrowing to enhance efficiency and become more profitable thus improving their creditworthiness amongst the borrowers towards achieving financial stability (Huang et al 2008).

The study examined of bank specific risk variables and economic determinants of Capital Adequacy Ratio of the commercial banks of Pakistan. In Pakistan risk weights are applied under Basel Capital Accord guidelines of Standardized approach but for liquidity, nonperforming loans ratio of the commercial banks of Pakistan taken as proxy, not inherently present in Basel Calculations for the period of study (Khemraj and Pasha 2009). We developed unique proxies for credit risk, market risk and operational risk exposures of the commercial banks of Pakistan as percentage of total assets to examine their riskiness in the capital adequacy ratio, where total assets of the bank indicate the extent of bank operations, size and asset portfolio. Total assets are directly linked with the fluctuations in the capital structure of the bank and therefore an important determinant of the capital ratios. Large banks enjoy good repute and ratings therefore subject to lower capital adequacy ratios see Jackson et al. (2002); Gropp and Haider (2007). The study also used natural logarithm of total assets as proxy of bank size (Kashyap and Stein 1995). Return on Equity and Return on Assets constitute most important profitability indicators. Profit directly influence capital base of the banks in form of retained earnings. In addition, the profit serves as proxy to the riskiness of banks assets impacting the risk management and Capital Adequacy Ratio (Buyuksalvarci and Abdioglu, 2011).

Economic growth historically encourages sector wise borrowing and directly impact minimum capital requirements of the banks through asset quality. In order to construct economic impact of banks capital requirements it is important to gauge economic activity in line with fluctuations in banks capital base, however the evidence in literature of a causal relationship is scarce (Martynova 2015). Gross domestic product (GDP) taken as proxy of economic activity where increased economic activity encourages borrowing directly affecting the size and quality of banking assets. Increased economic activity would thus imply better credit quality and lower CAR. GDP growth rates therefore is considered important determinant of the CAR with inverse relationship and included in our econometric model. Industrial production index of Pakistan (IIP) is an important proxy of economic activity concentrating sector wise banks' lending on manufacturing, mining, construction and energy distribution (Ali et al. 2010).

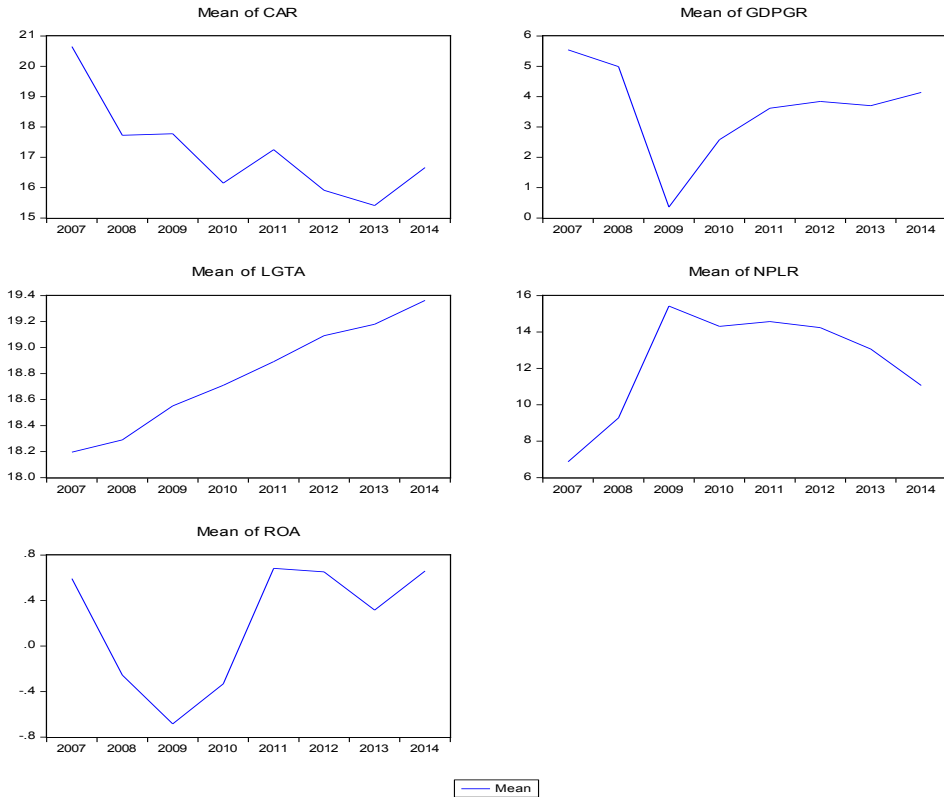


### 3. Commercial Banking in Pakistan

Financial liberalization in Pakistan began in early 90s when private sector, knocking at the doors of the banking sector of Pakistan was allowed a way in. Late 90s saw privatization of two large state-owned banks<sup>10</sup> out of seven at the time. The decade also witnessed minimized intervention by the government in banking sector of Pakistan. Pakistan commercial banks grew in asset size, similar trend followed in foreign banks' assets operating in Pakistan. Deposits and advances grew tremendously during the decade. Privatization further put in top gear through 2000's where the banking sector remained largely resilient even during the crises period (Jalil and Feridun 2011). Economic growth of Pakistan remained strong since 1950s recession, however steep decline in GDP growth rates (GDPGR) since 2007 witnessed suggesting that Global financial crises did penetrate Pakistan economy on the grounds of sudden decline in foreign investment. Nevertheless, recovery surfaced much quicker. Figure 1 shows return on assets (ROA) of commercial banks of Pakistan positively correlated with the GDP growth rates post 2009. The nonperforming loans (NPLR) show strong negative correlation with both GDP growth rates. Return on assets (ROA) also seem positively correlated with GDP growth rates with a nose dive from 2007 to 2009 and then showing a steep recovery curve post 2009 on the backdrop of decline in Nonperforming loans and GDP recovery. Commercial banks in Pakistan operate well above Capital Adequacy Ratio (CAR) threshold of 8% set by the Basel International regulatory guidelines and their internationally active counterparts. Capital adequacy ratio of commercial banks in Pakistan although witness downward trend since 2007 still hovers well above Basel Capital Regulations guidelines. The drop-in capital can be intuitive of a number of scenarios for example acting as a successful buffer to counter liquidity issues faced due to shortage in foreign investment and remittances evidenced by the resilience of the commercial banks of Pakistan; increasing asset portfolios; or simply to align with Basel Capital guidelines of 8%. Nevertheless, the total assets (LGTA) of banks in Pakistan show a constant growth pattern (see Figure 1 below). Despite rise in remittances, the GDP growth rates remained on a downward trend pre-recovery since 2009 due to decline in exports as well as presence of energy crises, inflation, security issues, poverty and inequality.

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10. Muslim Commercial Bank (MCB) and Allied Bank Limited (ABL) both banks part of the current big 6. Other 4 are United bank limited (UBL), National bank of Pakistan (NBP), Habib bank limited (HBL) and Bank Al-Falah (BAFL)



Source: Data collection of the study

Figure 1. Pakistani Banking Sector

#### 4. Methodology

The study adopts Panel Data methodology, suggested to be heterogeneous and allow that crucial control for individual heterogeneity, not integral in time series or cross section data designs (Beck and Katz 1995). Panel Data offered greater identification and measurement of effects because of its inherent analysis ability of variables across entities and over time. Panel data methodology deals with missing information far more effectively than mere time series or cross-sectional methodologies (Hsiao and Shen 2003). Multicollinearity, perhaps the strongest contender in afflicting time series and cross section studies with biased results, is dealt with adequately within panel datasets (Moulton 1987; Batlagi and Levin 1992)<sup>11</sup>. Panel data methodologies widely applied in studies of bank specific variables (BSV's)

11. Other advantages of panel data over time series or cross section include superior study of adjustment dynamics enabling to construct complicated behavioral modelling i.e. fewer restrictions applied in panel on distributed lags than time series (Deaton 1995; Koop and Steel 2001; Hsiao and Shen 2003); appropriately deals with issues of heteroscedasticity (Kaufman 2013); and reduced biased resulting from including similar variables in comparison with time series dataset (Klevmarken 1989).



and economic factors (EV's) and suggest significant association between BSV's and EV's<sup>12</sup>. Following econometric model was suggested by the study:

$$CAR_{it} = \beta_0 + \beta_1 CRR_{it} + \beta_2 MRR_{it} + \beta_3 ORR_{it} + \beta_4 ROA_{it} + \beta_5 ROE_{it} + \beta_6 NPLR_{it} + \beta_7 LGTA_{it} + \beta_8 GDPGR_t + \beta_9 IIPGR_t + u_{it}$$

Where  $\beta_0$  is constant and  $\beta (_{1,2,3...})$  represent coefficients of predictor variables and  $u_{it}$  is error term.

$CAR_{it}$  represent Capital Adequacy Ratio of bank  $i$  in year  $t$ ;  $CRR_{it}$  represent Credit risk weighted assets to total assets of bank  $i$  in year  $t$ ;  $MRR_{it}$  represent Market risk weighted assets to total assets of bank  $i$  in year  $t$ ;  $ORR_{it}$  represent Operational risk weighted assets to total assets of bank  $i$  in year  $t$ ;  $ROA_{it}$  represent Return of Assets of bank  $i$  in year  $t$ ;  $ROE_{it}$  represent Return on Equity of bank  $i$  in year  $t$ ;  $NPLR_{it}$  represent Ratio of non-performing loan to total loans of bank  $i$  in year  $t$ ;  $LGTA_{it}$  represent Natural logarithm of total assets of bank  $i$  in year  $t$ ;  $GDPGR_t$  represent GDP growth rates in year  $t$ ; and  $IIPGR_t$  represent Industrial production index of Pakistan growth rates in year  $t$ .

The sample captured annual data for an eight-year period starting from 2007 to 2014. Due to availability issues with key variables and units of measurement in the annual reports the sample was reduced to 25 commercial banks to achieve complete consistency in data. Collection of secondary data conducted from published annual reports of the sampled banks. The sample of 25 commercial banks accounted for more than 92% of the banking assets in Pakistan including 'big five' and therefore considered adequate for the study<sup>13</sup>. Out of 25 sampled banks, Kasb bank suffered losses and failed to maintain targeted capital adequacy ratios through this period and was taken over by Bank Islami in May 2015 resulted in no data available for Kasb bank for 2014 only. Nevertheless, unbalanced panel data character remains similar to balanced panel and is consistent (Baltagi and Levin 1992; Hsiao 2007; Wooldridge 2010). The time period chosen due to no information disclosure present on risk weighted assets and CAR before 2007 in Pakistan<sup>14</sup>. Basel Capital Regulations methodology applied across the board in Pakistan as standard since 2007. All commercial banks in Pakistan followed the standardized approach under Basel guideline set by the central bank State Bank of Pakistan. Capital Adequacy Ratio (CAR), the regulatory requirement following Basel Capital Regulation calculated as the ratio of risk weighted assets to capital of the commercial banks of Pakistan, constituted our dependent variable. Unique proxies were developed to test the statistical impact of Basel specified banking risks<sup>15</sup>. GDP and Industrial Production of Pakistan growth rates constituted economic activity reflectors<sup>16</sup>. In order to gauge the impact of the performance of the commercial banks of Pakistan on capital requirements profitability ratios and bank size<sup>17</sup> were taken. As discussed earlier, for the liquidity impact non-

12. See Keeton and Morris (1987); Salas and Saurina (2002); Jiang et al (2013); Zhang et al (2015). Panel data OLS and GMM methods applied to study economic indicators and bank specific variable in US, Spain, Europe, China and Taiwan

13. Quarterly performance review of the banking system October to December 2014, available at sbp.org.pk

14. Monthly or quarterly data not available for our key variables, Pakistan Bureau of Statistics release annual GDP growth rates of Pakistan only.

15. *Credit Risk (CRR)*: Actual credit risk weighted assets of the sampled commercial banks of Pakistan used to determine the credit riskiness of the total assets for each bank using following formula: Credit risk weighted assets/total assets x 100; *Market Risk (MRR)*: Market risk derived using formula: Market risk weighted assets/total assets x 100; *Operational Risk (ORR)*: Derived using formula ORR=Operational risk weighted assets/total assets x 100

16. *GDP (GDPGR)*: Annual GDP growth rates of Pakistan; *Industrial Production (IIPGR)*: Industrial production index of Pakistan (IIP) growth rates

17. *Profitability ratios (ROE and ROA)*: Return on Equity (ROE) and Return on Assets (ROA) taken from the financial statements of the sampled commercial banks of Pakistan calculated using profit after tax; *Bank Size (LGTA)*: The study used natural logarithm of total assets as proxy of bank size



performing loans<sup>18</sup> were considered.

## 5. Empirical Analysis

Sample means, medians, maximums, minimums, standard deviations, skewness and kurtosis, arranged in Table 1. Data asymmetry is evident as skewness negative for GDPGR, IIPGR, LGTA, ROE and ROA suggesting fat tails towards the left where CAR, CRR, MRR, ORR and NPLR with positive skewness. P-values for the calculated Jarque-Bera statistic show that null hypothesis for normality distribution assumption for CAR, MRR, ORR, GDPGR, IIPGR, ROE, ROA and NPLR rejected at 1%; rejected for LGTA at 5%; and rejected for CRR at 10%. (See Appendix: Table 1 Descriptive Statistics). Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), and Fisher-type (Choi 2001) test suggested to highlight issues of heterogeneity bias across cross-sections and confirm reliability of the parameter estimates, time series properties we examined our data. Levin, Lin and Chu (2002) test results significantly rejects the null hypothesis and hence all variables exhibit stationarity traits (Appendix: Table 2). Panel data allows for individuality of each cross section, for example level of staff expertise, cultural applications or occupational practices and so forth in each commercial bank of Pakistan. Panel data may be analysed with 'Fixed effects' and 'Random effects' techniques. Fixed effects (LSDV) model tackles the issue of heterogeneity by allowing each bank to have its own intercept value that does not vary over time. Fixed effects model seems to be appropriate, however in data sets with large number of cross sections in comparison with time periods Random effects appears appropriate<sup>19</sup>. Random effects estimation reported with generalized least squares (EGLS). Generalized Least Squares takes care of unobservable heteroscedasticity and autocorrelation contained in panel datasets. Hausman test based on chi-squared test static applied to decide between fixed effects and random effects models and then appropriate model reported (Wooldridge 2010). Hausman test reported whether the unique errors ( $u_i$ ) are correlated with regressors therefore null hypothesis under Hausman test is that unique errors ( $u_i$ ) are not correlated with regressors.

We start by reporting redundant fixed effects – likelihood ratio (Appendix: Table 3), we observe the value of F-statistic at 23.19 (p-value 0.000). The results suggest that panel data can apply either or both cross-section random and fixed effects estimation (Bai 2009).

## 5. Results and Discussion

In reporting our estimations results, Equation 1 correspond to cross section fixed effects and Equation 2 cross section random effects for comparison where the standard errors are reported in brackets. \*, \*\*, \*\*\* denote significance level at 1, 5 and 10% respectively. Hausman test reported (Appendix: Table 4) suggests that the coefficients of the random effects model are the same as fixed effects. Therefore, p-value is insignificant as per the results of the Hausman test, therefore null hypothesis not rejected by our data and therefore random effects model reported in detail.

Regression results above reports both models and presents the general picture. It is evident that all variables exhibit consistency in sign and significance in their relationship with Capital Adequacy Ratio in both models. Regression results show that credit risk, operational risk, banks size and profitability significantly impact Capital Adequacy Ratio. On the contrary proxies capturing market risk, non-performing loans, GDP growth and Industrial Production of Pakistan show no effect on Capital Adequacy Ratio. Random effects model observes R-square at 49% suggesting that half of the variability in capital adequacy ratio can be explained by the variables selected. The null hypothesis that all coefficients are simultaneously zero significantly rejected based on computed F-value of 38.97

18. *Non-performing loans (NPLR)*: Non-performing loan calculated as the ratio of non-performing loans to total advances of the sampled commercial banks of Pakistan

19. see Kaufman (2013)



( $p < 0.000$ ) of our panel estimation, therefore concluded that estimation is significant.

The results show that Credit risk (CRR), Operational risk (ORR), Bank Size (LGTA) and Profitability (ROE, ROA) have statistically significant impact on Capital Adequacy Ratio (CAR) of the commercial banks of Pakistan<sup>20</sup>. The results also show that Market risk (MRR), Non-performing loans (NPLR), growth in GDP (GDPGR) and Industrial Production of Pakistan (IIPGR) have no impact on Capital Adequacy Ratio (CAR) of commercial banks of Pakistan. Negative sign and significance of the coefficient of credit risk reflect to a negative relationship between Credit risk and Capital Adequacy Ratio confirming Basel Capital regulatory objective of raising Capital in times of economic slowdown to avoid credit default. The result shows that Pakistan benefited with compliance with Basel Capital Regulation.

**Table 1. Regression Results**

Dependent variable: CAR				
Explanatory Variable	Equation 1		Equation 2	
	FIXED EFFECTS		RANDOM EFFECTS	
Constant	167.3917*	(31.6648)	136.3107*	(14.7041)
CRR	-0.264053*	(0.063532)	-0.228854*	(0.031096)
MRR	-0.079384	(0.103639)	-0.039773	(0.097454)
ORR	0.181179**	(0.07284)	0.201769*	(0.033246)
NPLR	-0.051907	(0.045843)	-0.059094	(0.04565)
LGTA	-7.323359*	(1.516714)	-5.789702*	(0.717929)
GDPGR	0.074524	(0.599851)	0.120555	(0.699873)
IIPGR	0.044211	(0.239108)	0.010784	(0.284673)
ROE	0.052732**	(0.021481)	0.056857*	(0.014378)
ROA	-0.959714*	(0.359391)	-0.979191*	(0.33912)
Panel observation (unbalanced)	194		194	
R-squared	0.889358		0.493221	
Adjusted R-squared	0.866538		0.468433	
F-statistic	38.97281		19.8975	
Prob(F-statistic)	0.0000		0.0000	

Standard errors are reported in brackets. \*, \*\*, \*\*\* denote significance level at 1, 5 and 10% respectively

Source: Data collection of the study

We note that commercial banks in Pakistan operated with higher Capital Adequacy Ratio than Basel Capital Regulations recommendations due to prevailing political and economic environment of Pakistan. This observation corroborates with banking sector growth in Pakistan. Commercial banks in Pakistan decreased capital to align banks' capital with regulatory requirement resulting in asset growth. That with a trade-off of raised credit risk pointing out to the riskiness of assets and association with higher returns directly impacting the profitability of the commercial banks in Pakistan. The results confirm the complexity involved in keeping the CAR in line with regulatory requirements without compromising credit risk quality in Pakistan and questions significantly, the role of International Capital Regulation in influencing the minimum capital requirements of the banks. In addition, in Pakistan evidence lacks

20. Credit risk and Return on Assets bear a negative sign as per our regression results.





procyclicality<sup>21</sup>, therefore role of Basel Capital Regulation can easily be debated to encourage banks to get involved in riskier positions.

CAR of commercial banks in Pakistan not reflective of Market risk can be explained by the fact that banks in Pakistan mainly exposed to credit risk and have restricted market positions. This result is not consistent with our research intentions and Basel Capital Accord objectives. Our estimation further shows that NPLR has no significant impact on CAR, where Bank size is significant and bears a minus sign. The finding is significant and seems corroborative of the growth in Pakistani banking. Commercial banks in Pakistan largely operate with higher capital adequacy ratio and remain in position to further enhance their asset size. Our estimation reveals that both profitability indicators ROE and ROA have statistically significant impact on CAR. The results present the complexity of the concept in Pakistan making it a difficult task trying to control for profitability at the same time as carrying out required regulatory adjustments in the capital adequacy as profitability and capital adequacy coefficients predicting opposite signs.

## 6. Final Remarks

Results revealed that market risk and liquidity (NPL), two of the major risk determinants under International Basel Capital Regulation not reflected in the capital adequacy ratio of the commercial banks in Pakistan. Market risk is major constituent of the Basel capital adequacy formula and liquidity currently being phased in through Basel III accord. Nevertheless, both aforementioned variables are extremely important in gauging the risks faced by the commercial banks. Therefore, this identifies capital adequacy ratio as a weaker than expected representative of important banking risks faced by the banks. In contrast, the results of the secondary analysis of the study show that bank size and profitability are statistically significant in impacting on capital adequacy ratio. Therefore, we accept alternate hypothesis of the study and conclude that capital adequacy ratio under Basel Capital does not reflect important banking risks factors adequately in commercial banking sector of Pakistan. The results also show that the impact of procyclicality not reflected in capital adequacy ratio as economic indicators used for the study<sup>22</sup> remain statistically not significant in predicting capital requirements of the commercial banks in Pakistan. This could be explained by the fact that research only managed to accumulate data for a comparatively short period, only 8 years from 2007 to 2014 and therefore not covering complete business cycle to reflect procyclicality of Capital base variations of the commercial banks of Pakistan under Basel Capital Regulations. In addition, the result remains reflective of the sophistication of the GDP as a superior economic indicator incorporating whole of the economic activity of country and therefore diluting impact on capital adequacy ratio of the commercial banking sector of Pakistan. Nevertheless, despite all discussed the analysis also reveals that commercial banking sector of Pakistan remain financially healthy with higher than required Capital Adequacy Ratios by the Basel Capital Accords, thus creating additional capital buffer and therefore seemed adequately equipped to handling any form of the economic calamity.

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21. GDP and Industrial Production growth not significant. The result is not consistent with the research objective perhaps due to the fact that the research only takes into consideration data for a comparatively shorter period perhaps not enough to capture the procyclical impact of Capital Adequacy Ratio

22. Gross Domestic Product and Industrial Production Index growth rates



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## APPENDIX

Table 1. Descriptive Statistics

	CAR	CRR	GDPGR	IIPGR	LGTA	MRR	NPLR	ORR	ROE	ROA
Mean	17.19	50.85	3.596	3.372	18.78	4.162	12.38	7.841	-1.559	0.201
Median	14.47	47.90	3.770	3.515	18.88	2.880	10.13	6.495	7.410	0.660
Maximum	65.43	90.87	5.540	9.030	21.35	26.46	91.11	80.09	28.57	3.980
Minimum	0.560	10.41	0.360	-4.180	15.74	0.030	0.220	0.400	-270.5	-7.080
Std. Dev.	10.86	14.20	1.486	3.700	1.306	4.567	10.28	9.175	35.94	1.888
Skewness	1.898	0.392	-0.947	-0.567	-0.168	1.886	2.924	6.383	-3.944	-1.571
Kurtosis	7.088	2.990	3.331	2.946	2.201	7.368	19.65	46.36	22.95	5.751
Jarque-Bera	258.1	5.112	30.83	10.76	6.236	276.2	2545.7	16692.0	3816.9	144.6
Probability	0.000*	0.077***	0.000*	0.004*	0.044**	0.000*	0.000*	0.000*	0.000*	0.000*
Obs	199	199	200	200	199	199	196	196	199	199

\*, \*\*, \*\*\* denote significance level at 1, 5 and 10% respectively



**Table 2: Stationary Tests**

Variables	Levin, Lin and Chu	p-value	Im, Pesaran and Shin	p-value	ADF-Fisher Chi-square	p-value	PP-Fisher Chi-square	p-value
CAR	-22.86	0.00	-4.83	0.00	111.24	0.00	93.36	0.00
CRR	-28.45	0.00	-8.56	0.00	145.25	0.00	117.39	0.00
MRR	-9.79	0.00	-2.41	0.00	85.65	0.00	90.92	0.00
ORR	-72.80	0.00	-19.74	0.00	139.87	0.00	134.89	0.00
NPLR	-9.36	0.00	-2.55	0.00	83.86	0.00	104.57	0.00
LGTA	-8.35	0.00	0.82	0.79	59.56	0.16	46.89	0.59
ROA	-18.08	0.00	-6.07	0.00	136.55	0.00	136.14	0.00
ROE	-10.17	0.00	-3.37	0.00	100.13	0.00	110.86	0.00
GDPGR	-18.06	0.00	-5.66	0.00	137.02	0.00	97.28	0.00
IIPGR	-12.95	0.00	-4.99	0.00	125.71	0.00	90.66	0.00

**Table3: Likelihood Ratio**

Redundant Fixed Effects Tests

Equation: EQ01

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	23.196499	(24,160)	0.0000
Cross-section Chi-square	290.904129	24	0.0000

**Table 4: Hausman Test**

Correlated Random Effects - Hausman Test

Equation: EQ01

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	16.465030	9	0.0578