

Basel accord capital regulations and financial risk management: Empirical evidence from Pakistan's financial institutions

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ABSTRACT

The Pakistani banking sector has shown tremendous growth in the last two decades and witnessed strategic reforms including the implementation of Basel regulations. The objective of this study is to investigate the effect of Basel capital regulations on the various proxies of the financial performance of the Pakistani commercial banks. This study uses three different proxies to assess the effectiveness of the Basel capital regulations on the financial performance of Pakistani commercial banks from 2006 to 2018 and quantifies the effect of different Basel accords on the banking sector of Pakistan using the dynamic panel data estimation technique. In addition, the effect of the Global Financial Crisis (2008) on the financial performance of Pakistani banks has also been evaluated. The results indicate that Basel II and Basel III capital regulations have affected the banks' profitability differently. Capital regulations of Basel II have increased the performance while capital requirements of Basel III have not affected the financial performance of Pakistani banks, pointing towards the ineffectiveness of Basel III capital regulations. Besides, there has been no change observed in the financial performance of Pakistani banks during the Global Financial Crisis (2008). Overall, the results of the Generalized Method of Moments (GMM) technique show that Basel capital regulations enhance the financial performance of the Pakistani banking sector.

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1. Introduction

The banking industry plays an important role in a country's economy by acting as lubricating oil in it, and its collapse is connected to the default of the whole economy (Bashir & Hassan 2017). Due to their deposits, Ping (2014) acknowledges the special role of banks in the credit supply in the country. The disturbance of credit supply is the major obstacle to economic growth, and it can cause a major crisis like the American banking crisis of 1933. Due to the importance of banks to the country's economy, strict rules and regulations are required for them. Although the financial supervision of banks is as old as banks themselves, the significance of financial supervision and regulation has increased due to the defaults of various banks since 1970 (Valencia & Leaven 2008). Two conflicting viewpoints exist on the effect of bank monitoring and supervision (Yang, Gan & Li 2019). Advocates of the public interest state that, to cater to the common man's interest, the government should play its part in directing banks to offer adequate banking services, alleviating market discrepancies. While the private-interest view says that laws are used to entertain aristocrats rather than ordinary people.

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According to Vianney (2013), bank insolvencies in the near past few years highlight the major risks faced by banks. Murlon-Druol (2015) thinks that the defaults of Herstatt Bank and Franklin National Bank in Germany and America in 1974 stressed the need for tougher bank rules and a sound legal framework to reduce the pertinent risks associated with the banks. The governments and bank regulators jointly responded to these bankruptcies through strict banking regulations in accordance with the guidelines given by the Basel Committee on Banking Supervision (BCBS). This committee was founded in 1974 by the member nations of the G-10 (a group of countries with the ten largest economies in the world). Over the years, this committee produced three proposals named the Basel Accords, i.e., Basel I in 1988, Basel II in 2004, and Basel III in 2010. Basel I and II set the Total Capital to Risk-weighted assets (TCTR) also called Capital Adequacy Ratio (CAR) at 8%, while Basel III increased this ratio to 10.5% for banks in G10 countries.

Later, these capital adequacy regulations were adopted all over the world, including Pakistan. Capital ratios are the major tools for achieving a sound banking system (Mitchell, 1986). (Khan and Khan, 2007) were of the view that Pakistan witnessed financial sector reforms in three phases starting in the 1990s to increase its monitoring and supervision of financial institutions. They observed that during the third phase of these reforms, i.e., from 2002 to 2004, the State Bank of Pakistan (SBP) forced banks to increase the minimum capital requirement for banks. This was because the financial sector was about to collapse due to an increase in Non-Performing Loans (NPLs). The Pakistani banking industry faced an interesting situation from 2007 to 2018. On one hand, assets saw a rise of 421%, loans and advances enhanced by 238%, but on the other hand, profitability decreased. The return on average equity (ROAE) fell from 1.69% to 0.80%, while the return on average asset (ROA) fell by 42%, from 15.21% to 10.73% (Haris, Tan, Malik, and Ain 2020). During this period, the SBP was implementing Basel regulations to align itself with the international community. Basel II regulations were implemented in 2006, while the implementation of Basel III started on December 31, 2013.

To figure out how regulations like Basel II and III will affect the banking industry's financial performance, it's important to look at whether the banks have enough capital. Profitability is the most common measure of financial performance (Bilal & Salim 2016) so the objective of the study is to check the effect of Basel capital regulations on three different proxies of profitability of Pakistani commercial banks from 2006-to 2018. This study is unique in its novelty as it makes contributions in several ways. Firstly, this study tries to analyze the collective effect of Basel II and III capital regulations on the various proxies of financial performance of the Pakistani banking sector during 2006–2018 in the aftermath of financial sector reforms and Basel regulations. By doing so, it seeks to fill the gap in the empirical literature in one of the emerging markets in the world. Secondly, this is one of the few studies that quantify the Basel capital II and III effects on the financial performance of Pakistani commercial banks, as Basel III significantly differs from the previous two accords regarding capital to risk-weighted assets and the introduction of liquidity measures. Moreover, the investigation of Basel capital regulations' effects on the financial performance of Pakistani commercial banks during the Global Financial Crisis of 2008 (GFC) marks another contribution in this regard. This study will help banks and regulators like SBP evaluate the effectiveness of these regulations on the bank's performance and thus allow them to devise or amend regulations accordingly in the future.

2. Literature Review

This section presents the literature about the impact of capital regulations on financial performance. Naceur and Kandil (2009) found that bank capitalization did not affect one of the financial performer measures, i.e., the return on equity (ROE). However, the equity to asset ratio positively affected the return on assets (ROA) and net interest margin (NIM). They thought that high capital requirements led to low bankruptcies and low financing costs, which in turn led to high profits for the Egyptian banks that they looked at in their study.

Naceur and Omran (2011) investigated the impact of financial and institutional development on the financial performance of the Middle East and North Africa (MENA) countries from 1989–2005. Their findings showed that credit risk and bank regulations have a very significant positive effect on indicators of bank performance. Berger & Bouwma (2013) empirically checked the impact of capital on bank performance in the US from 1984–2010. They observed that capital adequacy regulations are very handy for the stability and survival of small banks during financial crises, as they were specifically interested in bank capital's impact on performance during the financial crisis and how this effect diverges over time. From 1994 to 2008, capital had a positive effect on the profitability of 42 Asian countries' banks from 1994 to 2008 (Lee & Hsieh 2013). They also observed that low income, especially in Middle Eastern countries, had the maximum positive impact of capital on profitability. They attributed this positive effect to the use of non-interest activities by banks in the region, as advocated in Islamic banking literature.

Ozili (2015) looked at the effect of Basel capital requirements on the financial performance of Nigerian banks. He concluded that the Basel capital requirements had a significant and positive effect on the bank's profitability. The same can be said about the impact of asset quality and bank size. Implementation of Basel III capital regulations on the financial performance of Omani banks during 2013–2015 was investigated by (Bilal & Salim 2016) by employing ordinary least square estimation. They concluded that Basel III capital regulation did not affect performance as its influence was insignificant. Ozili (2017) investigated the factors affecting the profitability of listed and non-listed African banks. He reported mixed findings based on his investigation, as capital regulations exert a positive effect on listed banks, while the profitability of non-listed banks was not affected by these regulations. He cited the different nature of internal (fundamental) and market (external) factors

in having this heterogeneous effect. Batten and Vo (2019) checked the factors affecting the Vietnamese banks' profitability from 2006 to 2014. They documented mixed findings for the capital adequacy ratio as a determinant of bank profitability. According to their research, the size of Vietnamese banks didn't allow them to be more profitable than their foreign counterparts because they were so small.

Haris et al. (2020) observed that banks with high capital ratios have high profitability in their sample of Pakistani banks. They were of the view that the high value of the minimum capital requirement (MCR) signals low bankruptcy, which reduces the debt cost and enhances profitability. Novokmet and Pavić (2020) investigated the aftermath effects of capital regulation on twenty Croatian banks from 2011 to 2016. They found a mixed effect of capital regulation on profitability measures. They opined that as there are different measures for different stakeholder groups, capital requirement regulation affects different profitability measures differently. Mujtaba et al. (2021) concluded that regulatory capital had positively affected the profitability of Asian banks from 2004 to 2017. Moreover, current year profitability is affected by the previous year's profit.

The above-mentioned empirical studies regarding the effect of capital requirements on bank performance report heterogeneous findings. Some argue that high bank capital requirements mitigate the effect of bankruptcy along with lower borrowing costs, thus exerting a positive impact on their profits. Others argue that high capital requirements discourage banks from making risky investments, resulting in fewer profits. Because there isn't enough evidence to say for sure that higher capital requirements make banks more profitable, this is a very important research topic in the field of capital regulation and banking stability.

3. Methodology

Dynamic panel data methodology, i.e., the Generalized Method of Moments (GMM) approach, is applied to measure the effect of Basel capital regulations on bank performance. It captures the dynamic behavior of the dependent variable. Moreover, Dynamic panel data methodology, i.e., the Generalized Method of Moments (GMM) approach, is applied to measure the effect of Basel capital regulations on bank performance. It captures the dynamic behavior of the dependent variable. Moreover, GMM also deals with the endogeneity issues of the explanatory variable. Roodman (2006) is of the view that to estimate GMM, instruments must be less than the number of banks. Hansen's test of over-identifying restrictions is employed to check the validity of instruments. GMM also deals with the endogeneity issues of the explanatory variable. Roodman (2006) is of the view that to estimate GMM, instruments must be less than the number of banks. Hansen's test of over-identifying restrictions is employed to check the validity of instruments.

3.1 Sample Selection and Data Gathering

The commercial banks of Pakistan listed from 2006 to 2018 are the sample of this research. The financial statements of these banks were used to collect data from their official websites. To validate the extracted data, the Orbis database is used.

Variables and their Measurement

Financial ratios are usually used to check financial performance. This study uses various proxies for bank performance. Firstly, bank performance is captured by Return on Equity (ROE). It is a measure of a company's profitability and tells how much profit a company makes from shareholders' money. It is obtained by dividing net income by the equity of the bank. Secondly, Return On Assets (ROA) reflects the revenue from the assets of the bank. It is computed by dividing net income by the total assets of the bank. Thirdly, Net Interest Margin (NIM) shows the cost and efficiency of financial intermediation by banks. It is calculated by dividing net interest income by the total assets of the bank. All these three proxies of bank performance are used following the work of Novokmet & Pavić (2020).

This study uses Total Capital to Total Risk-Weighted Assets (TCTR) to measure bank capital, according to Mujtaba et al. (2021). It is the percentage of the banks' capital that is at risk and is calculated by dividing the Total Risk-Weighted Assets of a bank by the total (sum of Tier 1 and Tier 2) capital. To measure asset quality, Non-Performing Loans to Gross Loans (NPLGL) is used. Ozili (2017) employed this in his study. Bank efficiency is captured by the proxy of Cost to Income (CIR). As a high value of this ratio is a measure of bank inefficiency, so results are stated for bank inefficiency and then interpreted with regard to bank efficiency. To measure liquidity, the study uses Cash & Cash Equivalent to Total Assets (CETA). The study uses size as a control variable. A natural log of the total assets of the bank is used to capture size here.

3.2 Empirical Model

The generic model of this study is as follows.

Performance = f (Lag Performance, Capital, Asset Quality, Efficiency, Liquidity, Size)

The study uses the following equations.

$$ROE_{it} = \beta_0 + \beta_1 L.ROE_{it} + \beta_2 TCTR_{it} + \beta_3 NPLGL_{it} + \beta_4 CIR_{it} + \beta_5 CETA_{it} + \beta_6 SIZE_{it} + e_{it}$$

$$ROA_{it} = \beta_0 + \beta_1 L.ROA_{it} + \beta_2 TCTR_{it} + \beta_3 NPLGL_{it} + \beta_4 CIR_{it} + \beta_5 CETA_{it} + \beta_6 SIZE_{it} + e_{it}$$

$$NIM_{it} = \beta_0 + \beta_1 L.NIM_{it} + \beta_2 TCTR_{it} + \beta_3 NPLGL_{it} + \beta_4 CIR_{it} + \beta_5 CETA_{it} + \beta_6 SIZE_{it} + e_{it}$$

4. Results

4.1 Descriptive Statistics

Descriptive statistics for all the banks included in this study are presented in Table 1. Here in this study, the average value of ROE is 11.61%. The minimum and maximum values of this financial performance metric are -98.94% and 37.27%, respectively. The average value of TCTR is 15.60%, which is way above the regulatory requirements of 8% and 10.5%. Its value varies from 1.92% (low) to 45% (high) approximately. Table 1 also shows that the banks have a 10.66% mean NPLGL ratio. While the NPLGL ratio fluctuates from a low of 0.27% to a high of 39.40%, the average value of CIR is 59%, while its high and low values fluctuate from 21.84% to 99% approximately. The average CETA bank stands at 9.03%, with its minimum and maximum value ranging from 3.91% to 17.71%. Its average value is 19.33, and its maximum and minimum values are shown in the Table 1 below.

Table 1

Banks' Descriptive Statistics

	ROE	TCTR	NPLGL	CIR	CETA	SIZE
Mean	11.61	15.60	10.66	58.92	9.03	19.33
S.D	16.84	6.20	6.73	17.13	3.07	1.19
Min	-98.94	1.92	0.27	21.84	3.91	15.80
Max	37.27	45.03	39.40	99.4	17.71	21.64

*Values rounded off to two decimal places

4.2 Testing for Endogeneity

First endogeneity in Eq. (1), Eq. (2), and Eq. (3) is tested by employing the Durbin and Wu–Hausman tests, and the values reported in Table 2 are significant. These significant values confirm the presence of endogeneity in the data.

Table 2

Endogeneity Testing

Regressors tested	Instrument Variable Used	Hausman test for endogeneity (p-value)
TCTR ROE	1.TCTR 1.ROE	71.45 (0.000)
TCTR ROA	1.TCTR 1.ROA	7.40 (0.0247)
TCTR NIM	1.TCTR 1.NIM	60.54 (0.000)

4.3 Impact of Basel Capital Regulation on Bank Performance

Table 3 displays the results of the effect of Basel capital regulations on banks' performance with ROE as a proxy for performance. From Table 3, bank regulatory capital has a significant positive effect on the ROE. Therefore, capital regulations positively affect the bank's profitability. Non-performing loans have a significant negative impact on the profitability of banks. This is according to expectations, as banks that have high non-performing loans tend to show less profitability. So, the results of this study show that banks with low non-performing loans perform better than their counterparts. These results confirm the results of Ozili (2015). CIR has a significant negative effect on the profitability of banks. In other words, banks that have higher expenses tend to have low performance. This is according to theory, as high CIR depicts the inability of the manager to control costs and banks have high expenses. According to the results of this study, banks' profitability is not affected by liquidity as the CETA coefficient is statistically insignificant. The results of this research reveal that size has a highly significant positive impact on bank profitability. So, according to this research, big banks have more chances of better performance than their small counterparts. Naceur and Omran (2011) also found a positive trend in their findings.

Table 3

Basel Capital Regulation on ROE

L.ROE	-0.537*** (0.038)
TCTR	1.477** (0.708)
NPLGL	-2.01*** (0.539)
CIR	-0.457** (0.176)
CETA	-0.076 (0.371)
SIZE	6.523*** (1.646)
Chi-square	350.92***
No. of Observations	148
No of Banks	23
Instruments	18
AR(2) (p-value)	0.284
Hansen test (p-value)	0.706

***, **, * Significant at 1%, 5%, and 10% levels

To generalize the results, this study also checks the impact of capital regulations on different proxies of banks' financial performance. These other proxies are ROA and NIM. By looking at Table 4 below, it is apparent that capital adequacy increases the bank's performance, as the coefficients of capital adequacy ratios have positive and statistically highly significant coefficients in both cases.

Table 4
Effect of Basel Capital Regulation on ROA and NIM

Variable	ROA	NIM
L.DV	-1.130*** (0.054)	0.332*** (0.094)
TCTR	0.771** (0.319)	0.082** (0.0330)
NPLGL	-0.118 (0.218)	-0.01 (0.014)
CIR	-0.218** (0.072)	-0.026*** (0.009)
CETA	0.1422 (0.197)	0.141*** (0.02)
SIZE	-0.332 (0.735)	0.014 (0.117)
Chi-square	566.18***	223.02***
No of Observations	148	148
No of Banks	23	23
Instruments	12	17
AR(2) (p-value)	0.484	0.746
Hansen test (p-value)	0.930	0.280

***, **, * Significant at 1%, 5%, and 10% levels

As shown by the results of Tables 3 and 4, capital regulations have enhanced the commercial bank's profitability in Pakistan. These results also point towards the effectiveness of capital regulations with respect to the financial performance of Pakistani banks.

4.4 Impact of Basel II Capital Regulations on Bank Performance

To quantify the impact of different capital restrictions imposed by the different Basel accords, the sample of this study is divided according to the timeframe of the implementation of the Basel Accords in Pakistan. Table 5 reports the findings of the effect of different factors on the bank performance of Pakistani commercial banks for the sub-sample Basel II. Table 5 shows that Basel II capital regulations have increased the performance of banks, as shown by the significantly positive coefficient of capital in all three proxies of bank performance under Basel II.

Table 5
Effect of Basel II Capital Requirements and Bank Performance

	ROE	ROA	NIM
L.DV	0.044 (0.085)	0.238* (0.092)	0.570*** (0.028)
TCTR	0.381** (0.157)	0.051** (0.022)	0.052** (0.019)
NPLGL	-0.447** (0.201)	-0.026 (0.018)	0.065*** (0.017)
CIR	-0.141 (0.119)	-0.022 (0.014)	-0.051*** (0.004)
CETA	-0.015 (0.165)	-0.015 (0.014)	0.035** (0.015)
SIZE	4.632*** (1.169)	0.3406** (0.119)	-0.349*** (0.093)
Chi-square	290.11***	204.64***	2388.73***
No of Observations	97	97	97
No of Banks	22	22	22
Instruments	14	14	20
AR(2) (p-value)	0.504	0.637	0.560
Hansen test (p-value)	0.222	0.133	0.244

***, **, * Significant at 1%, 5%, and 10% levels

4.5 Impact of Basel III Capital Regulation on Bank Performance

The effect of different factors affecting Pakistani commercial banks' performance for the sub-sample Basel III is reported in Table 6, which reports that the TCTR coefficient in all three proxies of bank performance is statistically insignificant. So, the capital regulations of the Basel III accord do not affect the bank's performance.

Table 6
Effect of Basel III Capital Requirements and Bank Performance

	ROE	ROA	NIM
L.DV	-0.378*** (0.057)	-0.270** (0.089)	-0.182*** (0.038)
TCTR	-0.865 (1.440)	-2.689 (1.699)	0.0446 (0.103)
NPLGL	-0.678 (0.8436)	0.084 (0.335)	-0.039 (0.046)
CIR	-0.955*** (0.286687)	-0.750* (0.454)	-0.098*** (0.013)
CETA	-0.190 (0.844)	0.591 (0.980)	0.1732* (0.089)
SIZE	-1.983 (3.398)	-9.372 (5.982)	-0.892*** (0.206)
Chi-square	634.56***	18.57**	144.21***
No of Observations	51	51	51
No of Banks	22	22	22
Instruments	15	9	15
AR(2) (p-value)	0.607	0.148	0.449
Hansen test (p-value)	0.578	0.337	0.551

***, **, * Significant at 1%, 5%, and 10% levels

So, it can be concluded from the above discussion that Basel II and III capital regulations have dissimilar effects on the banks' profitability. During Basel II, banks' financial performance increased, while under Basel III it has neither increased nor decreased.

4.6 Capital Requirements effect on Bank Performance during Financial Crisis

During the implementation of the Basel framework in Pakistan, the world witnessed the GFC in 2008. This crisis has uncovered the flaws in the financial systems of the developed countries, i.e., the USA and the UK. Pakistan, being a developing country, has also been affected by this. This study seeks to shed light on the effect of capital regulation on the profitability of banks during the financial crisis as well. According to the results reported in Table 7, capital regulations did not significantly affect bank profitability during the financial crisis of 2008 in all three proxies.

Table 7

Effect of Capital Requirements on Bank Performance during Financial Crisis

	ROE	ROA	NIM
L.DV	-0.869*** (0.012)	-0.609*** (0.034)	0.266* (0.156)
TCTR	-0.052 (0.032)	-0.072 (0.095)	0.006 (0.012)
NPLGL	-0.329** (0.128)	-1.825*** (0.423)	0.095 (0.029)
CIR	-0.076*** (0.023)	-0.371*** (0.092601)	-0.035** (0.013)
CETA	0.081 (0.072)	0.013 (0.207)	0.042 (0.028)
SIZE	0.444 (0.447)	6.988*** (1.659)	-0.141* (0.073023)
Chi-Square	118134.38***	4108.37***	279.44***
No of Observations	35	35	35
No of Banks	19	19	19
Instruments	14	14	14
AR(2) (p-value)	0.523	0.176	0.601
Hansen test (p-value)	0.830	0.461	0.197

***, **, * Significant at 1%, 5%, and 10% levels

5. Conclusion

This study has investigated the effectiveness of capital regulations Basel II and III on commercial banks' profitability. This study assumed four main relationships and found that overall capital regulations of Basel II and III have enhanced the commercial bank's profitability in Pakistan. These results show that Basel capital regulations have a positive impact on bank performance. This is coherent with the theory, as the high value of TCTR i.e., capital regulation, gives a signal of low bankruptcy and indicates a bright future. With high TCTR values, banks will incur a low cost of external funding, thus increasing their profitability. These results also point towards the usefulness of capital regulations with respect to the financial performance of Pakistani banks. These results support Lee and Hsieh's (2013) work. The results of this study also point out that individual Basel II capital regulations increased bank performance. This result is supported by the findings of (Ahmed, Ahmed, Islam & Ullah 2015). One reason for Basel II capital regulations' positive effect on performance can be attributed to their harmony with Basel I capital regulations. Although there is a gap of nine years between the implementation of Basel I and II capital regulations, both require capital for risk-weighted assets equal to 8%. From 2006 to 2013, this persistent same value can be attributed to an increase in performance. According to the results of this study, Basel III regulations neither enhanced nor decreased performance, thus rejecting the notion that Basel III capital regulations have a positive impact on bank performance. These results point towards the inability of Basel III to enhance or reduce bank performance. This is in line with the work of (Bilal & Salim 2016). One justification of Basel III's insignificant effect can be put forward: an increase in the ratio of regulatory capital from 8% in Basel II to 10.5% in Basel III might have played its part. Another possible argument could be that there is not enough time for Base III CAR to show its trickle-down effect. Banks are unable to transfer the incremental effect to their profitability yet. This study did not find any significant impact of capital regulations on bank performance during the financial crisis of 2008, rejecting the notion that Basel capital regulations have a positive impact on bank performance after the financial crisis of 2008. As highlighted by the Financial Stability Review (2007-08) of the State Bank of Pakistan, the banking sector of Pakistan was in good condition despite the challenges faced since late 2007 due to strong regulatory supervision. The CAR of the banking sector stood at 12.1% at the end of June 2008, well above the required 8%. A small exposure of Pakistani banks to global financial transactions could be a reason for this. According to Subohi (2012), a senior anonymous Pakistani banker said, "We have been able to escape the effect not because of some superior, more efficient safeguards that we had, but because we are too weak to figure in the global financial matrix." Another possible reason for this insignificant effect is the absenteeism of the amalgamation of the domestic financial sector with the international financial sector. Because Pakistani banks have a small share of the world's financial markets, this could also be the reason.

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