4. The Impact of Business Cycle on Pakistani Banks Capital Buffer and Portfolio Risk

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Abstract

This study attempts to estimate the impact of business cycle on Pakistani banks capital buffer and portfolio risk. Dynamic Panel data model, which includes a set of control variables reflect bank characteristics, has been estimated by using two-step Generalized Method of Moments (GMM) during the period of 2004-2014. The main results exhibit that bank capital buffer fluctuates counter-cyclically but business cycle fluctuations have no significant impact on portfolio risk. The main results support to Basel III accord that capital conservation buffer and counter-cyclical capital buffer are essential for banking institutions to help the economy. This study departs from existing literature because it focuses on developing country in assessment of behavior of capital buffer in a cyclical manner. The study contribute to the existing literature by revealing that counter-cyclical fluctuation of capital buffer may be due to shortsightedness of banks or low loan demand during downturns. This study will help policy makers to make and implement viable decisions on the optimal capital buffers and policy maker will seize an opportunity to devise strategies to ensure that banks have a sufficient buffer built up at all times to help protect the banks, their depositors and the economy at large.

Keywords: Basel accords, two-step GMM, business cycle fluctuations, counter-cyclical buffer, capital conservation buffer

JEL Classification: C33; G 21; G28

1. Introduction

A sufficient amount of capital, maintained by banks is considered as a mark of assurance for their capabilities to meet their obligations and to protect them from probable losses due to economic stress and rapid credit growth. In Pakistan, the banking sector comprises of

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commercial banks, foreign bank, Islamic banks, micro-finance banks, specialized banks, and institutions of financial development and growth, etc. The State Bank of Pakistan (SBP), the central bank, is sole regulatory and supervisory authority to monitor all banks in Pakistan. The minimum capital requirement (MCR) for all banks is currently Rs10 billion, in accordance to Basel III instructions set by Basel Committee on Banking Supervision (BCBS). However, capital to risk weighted assets ratio (CAR) requirement is 10%. The CAR requirements will be gradually increased to 12.5% by December 31, 2019 with the inclusion of 2.5% capital conservation buffer. Moreover, leverage ratio requirement will be 3%. State Bank of Pakistan (SBP) set the CAR requirement higher than BCBS considering that excess capital may be utilized as cushion for counter-cyclical capital buffer. Thus, counter-cyclical capital buffer ensures that when the entire financial system faces a stressful period of post credit boom at that time the flow of credit in the economy can be facilitated to some extent (SBP, 2013). When credit risk in lending becomes materialized, which is often related to business cycle, probably the capital shock is driven by credit risk. During the times of an economic downturn when counterparties are more prone to be downgraded, a rise in anticipated credit risk is evinced whereas during times of economic boost, it decreases.

In Pakistan, risk profile of the banking sector showed a rising trend since 2003. Moreover, the period between 2003 and 2006 showed high growth and low interest rates, but the period between 2007 and 2010 evinced lower growth and higher interest rates (SBP, 2011). Global financial crisis 2007-2008 damaged the Pakistan economy but it had no direct effect on the banking sector. The surge in prices of various global commodities remained a very predominant aspect in the catastrophe of affecting the macroeconomic fundamentals, leading to 81.7% deficit in external current accounts during 2008.It was the cause of oil import bill shooting up to over US$ 11 billion in 2008. It was relatively US$ 5.3 billion, on an average during 2004-2007. A large increasing trend caused fiscal deficit to be accounted for the delay in pass-through on international hike in prices at retail levels (State Bank of Pakistan, 2008-09). In spite of economic challenges in domestic and international environment, scenario of banking sector in Pakistan showed much resilience to early strong winds with robust capital base and sound profitability. The banking sector cope up the increasing trend in NPLs by heavy provisioning, increasing every year since 2004. A strong resilience was demonstrated by the sector and during the economic slowdown the most of banks maintained the capital buffer between 2004 and 2014 (SBP, 2004-2014).

According to the theory of capital buffer, banks' optimum capital buffers could be predicted as positively reliant on assets risk. If banks have increased assets risk, a need for higher capital buffer is seen (Myers & Majluf 1984; Milne & Whalley 2001; Heid *et al*., 2004). The prime determinant factor of asset risk for traditional banks is credit risk. Therefore, those banks that have higher credit risks they also have more eminent optimum capital buffers. During a boom, there is a pro-cyclic fluctuation of credit risk when it is being materialized over the business cycle. At the time of busts, there is less likelihood of loans to become defaulter. However, during booms when loan portfolio of the banks is being expanded, there is a high probability for banks to take credit risks. Thus, during booms, banks that are forward looking build their capital buffers up so that they are in a position to better materialize their credit risks at the time of busts. As against this, there may be shortsightedness. This is to say that in order to account for the rising credit risks for not being able to build up capital buffer during the upturns of the business cycle banks have to increase their capital buffer while experiencing the downturns of the business cycle (Borio *et al*., 2001; Milne & Whalley, 2001; Ayuso *et al*., 2004).

The economic cycle has the influence on risk level and ability to make the process of raising capital easy (Lindquist, 2004; Van Roy, 2008). At the time of downturns, the Non-performing loans (NPLs) tend to increase whereas when there is an economic boom; banks increase their risk exposure by expanding their assets. In case there is a counter-cyclical fluctuation occurs in capital buffer, it indicates that banks increase capital as economic conditions worsen. Hence, it is more costly for poorly capitalized banks to meet the minimum capital as per the regulations in busts. This is because banks that are not sufficiently capitalized face the challenge of materializing risk in a business cycle and the downturns generally have two choices to avert going down the minimum capital requirement. The first option is to increase the capital but this may turn out to be very difficult in a downturn due to the reason that there are expensive and very few external capital sources capital sources and retaining the profits may infeasible for the bank because the returns are not high. The second option is that by reducing the risk-weighted assets, the capital buffer of the banks may rise (Borio *et al.,* 2001).

Nonetheless, assets that are bank specific are generally more marketable and the costs could be downcast throughout when there is a downturn in the business cycle so much so that a sale connotes losses that are prohibitory. As a result, through a cut in lending, the risk in weighted assets is decreased. If the cutting down of lending is more substantial as compared to the indicated demand of lowering loan, during the business cycle's downturn there is a further amplification of the capital buffers and these buffers counter-cycle fluctuate during the business cycle (Borio *et al.,* 2001; Ayuso *et al.,* 2004; Stolz & Wedow, 2011). Due to this fluctuation, the impact of economic shocks on lending is magnified and in this way, the economic stability is impacted by the cyclical behavior of capital buffer. Considering the cyclical behavior of capital buffer lead to the introduction of new reforms in Basel III and the negative capital buffer requirement restricted within a range of 0-2.5% imposed on banks. .

A German banks' study by Stolz and Wedow (2011) from 1993-2004 revealed similar outcomes like Ayuso *et al.* (2004) and found counter-cyclical fluctuation of capital buffer over business cycle. Carvallo, Kasman and Busun (2015) examined capital buffer fluctuations for 13 Latin American and Caribbean countries for the period of 2001–2012 and found negative impact of business cycle for five countries and positive impact for six countries. Moreover, Vu and Turnell (2015) investigated capital buffer behavior for 13 Australian banks over the period from 1993 to 2011 and concluded that there is a negative relation between business cycle and capital buffer for all banks on the other hand there is a positive relation between the two variable for four big banks. A study by Shim (2013) leads to the conclusion that in the US, banks' capital buffer negatively co-moves with the business cycle. There is also a negative impact of business cycle on risk adjustments. The study also found out that there is a negative relation between default risk and business cycle. On the contrary, Adesina and Mwamba (2018) investigated the 14 African banks' cyclical behavior of capital buffer during 20004-2014 and found a positive co-movement of capital buffer with the business cycle, banks increase their capital buffer during upturns to utilize during downturns. Similarly,Guidara *et al.* (2013) investigated six biggest Canadian banks during 1982-2010 and also found that there is positive co-movement of capital buffer with the business cycle. This contrasts with the findings of similar studies on the USA and European countries (Ayuso *et al.,* 2004; Jokipii and Milne, 2008; Stolz and Wedow, 2011; Shim, 2013). Moreover, for the Indian banks Mahakud & Dash (2013) examined capital buffer behavior for 65 commercial banks of India for the period of 1996–97 to 2007–08 and found countercyclical fluctuation of capital buffer. Similarly, Valencia and Bolanos (2018) studied the business cycle impact on capital buffer in 25 developed and 54 developing countries and found higher counter-cyclical fluctuation of capital buffer over the business cycle in the developing countries. The result refers to pro-cyclical behavior and reinforces the Basell III suggested counter-cyclical capital buffer requirements. Contrary to Ghosh (2008), who investigated capital buffer behavior for 60 Indian banks for 1997-2006 and found positive impact on business cycle fluctuations on capital buffer. Similarly,Nicolay, Moraes and Tiberto (2018) studied the effect of business cycle on capital buffer of the Brazilian banking sector during 2006-2016 and concluded that there was pro-cyclical movement, banks decreasing capital buffer and increasing risk exposure during economic boom.

As such, a plethora of literature does not show consensus on the relationship between bank capital buffer and business cycle. Therefore, this research will also assess whether capital buffer of banks face fluctuations pro-cyclically or counter-cyclically during the business cycle. This study is different from the previous studies since it focuses specifically on a developing country and it also addresses the question pertaining to buffer theory that how do banks with different capital buffer conditions adjust capital buffer and portfolio risk during the business cycle fluctuations? The next section explains the research design and methodology, in Section III the empirical results are discussed and finally, Section IV concludes with interesting results of the study.

2. Methodology

In order to examine the relationships of variables in the research framework, annual data of all 33 commercial banks has been extracted from bankscope database and SBP during the period 2004-2014. The commercial banks in Pakistan as on December 2014 consist of 5 public sector banks, 17 local private banks and 7 foreign banks. Although in Pakistan banks started the Basel Accord implementation in 1997, the banks were often confidential and bank wise published data of capital adequacy ratio were not available before 2004. The dynamic panel data model has been applied to capital buffer and risk equations so that the impact caused by the fluctuations of business cycle on the banks' capital buffer and risk-taking decisions could be analyzed (Blundell & Bond, 1998; Blundell, Bond & Windmeijer, 2001; Mahakud & Dash, 2013; Azeem, 2015; Ashley & Sun, 2016; Moral, Allison & William, 2017). The empirical framework, which includes the business-cycle variable *(CYCLEGAP),* as well as characteristics of the bank, can be represented by the following equations:

$$\Delta AbBUF_{i,t} = \alpha_0 + \alpha_1 CYCLEGAP_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 ROA_{i,t} + \alpha_4 INV_{i,t} + \alpha_5 LIQUID_{i,t} + \alpha_6 DyMERGER_{i,} + \alpha_7 \Delta RISK_{i,t} - \alpha_8 AbBUF_{i,t-1} + \varepsilon_{i,,t} \quad (1)$$

$$\Delta RISK_{i,t} = \beta_0 + \beta_1 CYCLEGAP_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 ROA_{i,t} + \beta_4 INV_{i,t} + \beta_5 LIQUID_{i,t} + \beta_6 DyMERGER_{i,t} + \beta_7 \Delta NPL_{i,t} + \beta_8 LLOSS_{i,t} + \beta_9 \Delta AbBUF_{i,t,} - \alpha_{10} RISK_{i,t-1} + \mu_{i,t}, \quad (2)$$

where: absolute capital buffer *AbBUF* is capital-to-risk-weighted-assets ratio minus minimum capital ratio between 0.08 and 0.1. *RISK* is the ratio of risk-weighted assets to total assets. *CYCLEGAP* is the *Hodrick-Prescott (HP) filtered* GDP growth, which is used as a proxy for the business cycle. *SIZE* is the bank size measured as the natural log of the bank total assets. *ROA* denotes the ratio of annual net profit to total assets and investments in government securities *INV* is the ratio of government investment to total assets. *LIQUID* is the ratio of liquid assets over the total assets. *DyMERGER* is a dummy variable which is 1 for the acquirer in the year of the merger, and zero otherwise. *NPL* is the ratio of non-performing loans to total assets as a proxy for asset quality. *LLOSS* is the ratio of new provisions to total assets as a proxy of current loan losses provisions.

3. Empirical Results

Dynamic panel data model has been estimated by two-step Generalized Method of Moments (GMM) proposed by Blundell and Bond (1998). This method basically consists of estimating a system of both difference and level equations using lagged levels to instrument differences and lagged differences to instrument levels. Lags of each dependent variable have also been included as instruments. The consistency of the GMM estimation depends on the instruments' validity and uncorrelated disturbances in the equations (Valencia & Bolanos, 2018). The Fisher type unit root test shows that variables are stationary. The p value of the variables in Fisher type unit root test is lower than 0.05, indicating that the variables are stationary (see the Appendix). Table 1 shows the number of observations, mean, standard deviation, minimum and maximum values of dependent and independent variables for capital buffer and portfolio risk analysis.

Table 1

Descriptive Statistics of Variables

Variables	Definitions	Obs	Mean	Standard Deviation	Min	Max
CYCLEGAP	Business Cycle	323	0.50	1.97	-3.80	4.12
ΔRISK	Changes in risk	277	-0.01	1.40	-16.08	16.47
LIQUID	Liquidity	319	0.41	0.23	0.02	3.05
SIZE	Size	323	10.95	2.05	0.97	14.38
ROA	Return on assets	322	-0.09	1.82	-32.65	0.14
INV	Investments	287	0.24	0.14	0.003	1.39
$AbBUF_{t-1}$	Lagged capital buffer	321	0.26	1.14	-0.14	17.03
ΔAbBUF	Changes in absolute capital buffer	277	0.03	0.99	-4.13	13.86
$RISK_{t-1}$	Lagged risk	278	0.69	1.00	0.07	17.00
NPL	Non-performing loans	281	0.12	0.13	0.0001	1.10
LLOSS	Loan losses provision	295	0.51	3.71	0.00003	43.46

An average change in the absolute capital buffer *(ΔAbBUF)* is 3% and average lagged absolute capital buffer is 26%. It indicates that banks are increasing capital buffer under regulatory requirement. An average change in the risk weighted assets *(ΔRISK)* is -1% and the average lagged risk is 69%. It shows that banks are managing their risk weighted assets while maintaining capital buffer. Average liquidly *(LIQUID)* is 39% and average *ROA* is 23%.

Table 2 shows the dynamic panel data model results estimated by two-step GMM proposed by Blundell and Bond (1998) for capital buffer and portfolio risk analysis.

The Wald chi-square statistics shows that, overall, the variables included are significant at p=0.000 in both equations explaining the variation in capital buffer and portfolio risk. The Sargan test statistics show that instruments are uncorrelated with the error term at p>0.05 in both equations. Arellano and Bond (1991) postulated that the consistency of estimates is subject to an optimal choice of instruments where the validity of instruments depends on the absence of higher-order serial correlation in the idiosyncratic component of the error term. In this respect, the authors suggested that there should be significant AR (1) serial correlation and lack of AR (2) serial correlation. In this respect, in the capital equation there is no first order AR (1) and second order AR (2) serial correlations. On the contrary, in the risk equation the first order serial correlation is negative and significant, but there is no second order serial correlation. This is consistent with Arellano and Bond's (1991) suggestion.

Table 2

Estimations for Capital Buffer and Portfolio Risk Analysis

Independent Variables	ΔAbBUF			Indepen-dent Variables	ΔRISK		
	Beta Coefficient	z-value	p-value		Beta Coefficient	z-value	p-value
CONSTANT	(-0.029)	-0.46	0.640	CONSTANT	(0.717)***	28.13	0.000
CYCLEGAP	(-0.009)**	-2.47	0.010	CYCLEGAP	(0.004)	1.25	0.211
$\Delta RISK_{t-1}$	(-0.033)**	-2.02	0.040				
$LIQUID_{t-1}$	(0.251)**	2.320	0.020	$LIQUID_{t-3}$	(0.061)**	2.47	0.013
SIZE	(-0.001)	-0.059	0.550				
ROA	(0.613)	1.470	0.140	ROA_{t-2}	(1.651)**	2.47	0.014
DyMERGER	(-0.030)***	-2.920	0.000	DyMERGER	(0.013)	1.05	0.292
INV	(-0.040)	-1.141	0.250	INV	(-0.473)***	-5.40	0.000
$AbBUF_{t-1}$	(-1.146)***	-33.60	0.000				
				ΔAbBUF	(-0.206)*	-1.73	0.085
				$RISK_{t-1}$	(-1.001)***	-114.76	0.000
				ΔNPL	(0.183)***	4.75	0.000
				LLOSS	(0.0007)	1.57	0.117
Wald Joint test	76366.540		0.000		1.91e+08		0.000
Sargan test statistic	10.914 Chi 2(70)		0.76		8.119 Chi 2 (70)		0.62
AR(1) test	-1.203		0.228		-2.314		0.020
AR(2) test	1.065		0.286		0.779		0.435

***,** and * indicate statistical significance at the 1, 5, and 10 percent level, respectively. Wald Chi-Square statistic shows overall model significance, Sargan test statistics refer to over-identifying restrictions and AR (1) and AR (2) tests refer to first and second order serial correlation.

Capital regulations having pro-cyclical elements exacerbate the economic cycle fluctuations (Huang&Xiong, 2015). As such, in this study the term pro-cyclical (countercyclical) refers to the co-movement with (movement in opposite direction of) the business cycle. The estimation results in absolute capital buffer *(ΔAbBUF)* equation suggest that adjustments in capital buffer *(ΔAbBUF)* are significantly and adversely affected by the business cycle fluctuations *(CYCLEGAP)*. The negative coefficient indicates that capital buffer fluctuates counter-cyclically. In other words, capital buffer increases with the worsening in economic conditions. Capital buffer theory assumes that the optimum capital buffer of banks relies on assets risk positively. Banks with high assets risk must have high capital buffer as insurance against riskier assets portfolio. Traditionally, loans are considered to be the most important category of assets, whereas credit risk is obviously the main driver of assets risk. With the degree of fluctuation in credit risk over the fluctuation in business cycle, the optimum levels of capital buffers also fluctuate accordingly during the business cycle. Capital buffers fluctuate pro-cyclically or counter-cyclically, depending on whether materializing for credit risk is provided by banks in a downturn through raising capital buffers in an upturn trend (Stolz, 2007; Stolz & Wedow, 2011). The result contradicts the capital buffer theory assumption; there may be two arguments for the counter-cyclical fluctuation of capital buffer as suggested by Ayuso (2004), and Stolz, (2007). One may imply shortsightedness, in order to account for the rising credit risks for not being able to build up capital buffer during the upturns of the business cycle. Hence, banks have to increase their capital buffer while experiencing the downturns of the business cycle. On the other hand, Nicolay, Moraes and Tiberto (2018) concluded that banks decrease capital buffer and increase risk exposure during economic boom.

As against this, demand-side effects could also be witnessed as a negative sign, because the rising loan demands decreases (or increases) the capital buffers of banks during the upturns of the business cycle. The result is in accordance with findings of earlier studies (Tabak *et al.,* 2011; Vu & Turnell, 2015; Carvallo *et al.,* 2015). The result also suggests that Basel III counter-cyclical capital buffer justifies the financial stability. It is accumulated in economic upturns to be used in economic downturn, which may indicate rise in non-performing loans and cut in lending (Tabak *et al.,* 2011). On the contrary, Adesina and Mwamba (2018) reveal positive co-movement of capital buffer due to reduction in cost of equity capital over the business cycle.

The result in the risk equation does not support the hypothesis that banks' portfolio risk fluctuates pro-cyclically over the business cycle. There is a positive but insignificant impact of *CYCLEGAP* on the changes in portfolio risk *(ΔRISK)*. The positive coefficient implies pro-cyclical fluctuations of risk-weighted assets. However, this increase is negligible as the coefficient estimate is insignificant and very small in magnitude. The insignificant pro-cyclical behavior of risk-weighted assets may be due to increase in risk-averse behavior of banks and decline in net credit disbursement to the private sector (Mehdi, 2015). Huang and Xiong's (2015) finding is consistent with the current result. Changes in lagged portfolio risk $(\Delta RISK_{t-1})$ has a negative and significant impact on changes in absolute capital buffer *(ΔAbBUF)* at $p<0.05$. It reflects that decrease in risk-weighted assets increases the capital buffer. However, the impact is lagged by one year. It may indicate that most of the assets of Pakistani banks are tied in risk-free government securities. The result is consistent with Guidara *et al.* (2013), Vu and Turnell (2015). On the contrary, the result are inconsistent with the findings of Shim (2013), Busun & Kasman (2015), Huang and Xiong (2015), who found that riskier banks hold more capital buffer.

Changes in absolute capital buffer *(ΔAbBUF)* have a negative and significant effect on changes in portfolio risk *(ΔRISK)* at $p<0.1$, reflecting that banks increase their capital buffer by reducing asset's portfolio risk, and that there is a two-way relationship between adjustments in capital buffer and portfolio risk. The result is in line with the finding of Guidara *et al.* (2013). It may imply that banks maintain capital buffer in Pakistan by holding substantial investments in risk-free government securities. The results also depict the clear situation of Pakistani banks, since according to SBP the average banking sector's capital adequacy ratio during 2004-2014 was above the minimum capital adequacy requirement, ranging from 10.5% to 17.1%. On the other hand, during the same period the investments in government debt securities increased by 700% (SBP, 2004-2014). This scenario clearly shows the inverse relationship between capital buffer and portfolio risk.

Lagged Liquidity $(LIQUID_{t-1})$ has a positive and significant impact on changes in absolute capital buffer *(ΔAbBUF)* at $p<0.05$. However, the impact is lagged by one year. Hence, unexpected positive effect shows that banks with higher levels of liquid assets in their portfolios also uphold higher capital buffers. An alternative interpretation for this positive impact may be that banks hold high capital buffers by minimizing the denominator in capital to risk-weighted ratio. Moreover, liquid assets comprise cash, balances with banks, call money lending, repo lending, federal government securities and provincial government securities. Hence, government securities in liquid assets reduce the weightage of risk. Stolz and Wedow, (2011) defined positive relationship as to provide for the corresponding market risk. Shim (2013) suggested that liquidity source is used when external financing is costly in the presence of market frictions. Similarly, Nicolay, Moraes and Tiberto (2018) asserted that less risk (high capital buffer) is taken by more liquid banks.

Lagged Liquidity *($LIQUID_{t-3}$)* has a positive and significant impact on changes in portfolio risk *(ΔRISK)* at $p<0.05$. Moreover, the effect is lagged by three years. It shows that a rise in liquid assets will impact in the long run on the changes in risk-weighted assets. The plausible reason for the lagged effect may be that most of the banks' liquid assets are tied in government investment, so that the impact on adjustments in portfolio risk is not instantaneous. Hussain and Hassan (2005) postulated that banks having higher liquidity attempt to show willingness in enhancing the levels of risk. The result is consistent with the previous studies (Jokipii & Milne, 2011; Zheng, Xu & Liang, 2012).

SIZE has a negative, but insignificant impact on the changes in absolute capital buffer *(ΔAbBUF).* The result suggests that in Pakistan the major impact on adjustments in capital buffer may be due to the risk-averse behavior of banks. Hence, the result is compatible with the previous studies (Carvalo *et al.,* 2015; Azeem, 2015; Xu, 2016). Return on Assets *(ROA)* has a positive, but insignificant impact on the changes in absolute capital buffer *(ΔAbBUF).* As suggested by Gosh (2008), to raise capital is costly, so that retained earnings may be employed to raise capital buffer. On the contrary, in the case of Pakistan *ROA* has not any significant role to raise capital buffer. The result is supported by Stolz and Wedow's (2011) findings. On the contrary, Daher, Masih and Ibrahim (2018), and Valencia and Bolanos (2018) asserted that profitable banks increase their capital buffer through retained earnings.

Lagged Return on Assets *(ROA_{t-2})* has a positive and significant impact on the changes in portfolio risk (ΔRISK) at $p<0.05$. It shows that higher profitability may induce banks to increase risk for higher returns. However, the impact is lagged by two years and implies that the Pakistani banks earn profits in the long run due to increment in portfolio risk. It may come from investments and advances so that the impact is not immediate. Maji and De (2015) also argued that banks having higher risk should have higher expected profit and would try to raise capital by investing a portion of the realized income. Merger *(DyMERGER)* has a negative and significant impact on the changes in absolute capital buffer *(ΔAbBUF)* at $p<0.01$. It reflects that the acquiring banks are typically better capitalized before a merger and when weakly capitalized banks are merged with healthy banks a decrease in the capital buffer is expected in the year of merger. Kleff and Weber, (2008), Azeem (2015) also argued that to mitigate the financial distress the capital is consumed by merger.

Merger *(DyMERGER)* has a positive but insignificant impact on the changes in portfolio risk *(ΔRISK).* It indicates that acquirer bank is quite healthy for distressed merger, so that the merger could not significantly impact on risk. The finding is compatible with the previous studies (Heid *et al.,* 2004; Stolz & Wedow, 2011). Investments in Government securities *(INV)* have a negative effect on the changes in absolute capital buffer (ΔAbBUF), but it is insignificant. The result reflects that banks having bigger government-security holdings kept aside, not sold, may lead them to have low capital buffer. Hussain and Hassan (2005), Aggarwal and Jacques (2001) also suggested that banks that had more percentage of government securities usually expected to have more capital when they sold their securities.

The effect of Investments in government securities *(INV)* on changes in portfolio risk *(ΔRISK)* is negative and significant at $p<0.01$. It implies that bank assets portfolio comprises less risky investments and the Pakistani banks may increase capital buffer by decreasing risk-weighted assets. Aggarwal and Jacques (2001) also found the negative association between investments and portfolio risk.

Lagged absolute capital buffer capital *($AbBUF_{t-1}$)* parameter estimates show the speed of adjustments in capital buffer to desired levels and it is negative and significant at $p<0.01$, with the parameter estimates of -1.146. On the other hand, Lagged risk *($RISK_{t-1}$)* parameter estimates show the speed of adjustments in portfolio risk to desired levels and it is negative and significant at $p<0.01$, with the parameter estimates of -1.00. The amplitude of the estimates shows that banks adjusts capital buffer faster than portfolio risk.

First difference of non-performing loans *(ΔNPL)* has a positive and significant impact on changes in portfolio risk *(ΔRISK)* at $p=0.01$. It indicates that by adjustments in non-performing loans, the portfolio risk also increases. In Pakistan, non-performing loans amounted to Rs 604 billion by the end of 2014 (SBP, 2004-2014). Moreover, NPLs reached Rs 630 billion by end of June, 2015 (Alam, 2015). The result is consistent with the finding of Zhang *et al.,* (2008), who argued that asset quality is not only the outcome of risk behavior, but it is also an influencing factor for the risk taken by the banks. Current Loan Loss provisions *(LLOSS)* has a positive, but insignificant impact on changes in portfolio risk *(ΔRISK)*. However, the positive coefficient shows that the effect of *LLOSS* on changes in portfolio risk is negligible, because the coefficient estimate is not significant and very small in magnitude. Busun and Kasman, (2015) also found the positive and insignificant effect of loan loss reserves on risk. On the contrary, Rime (2001) argued that banks with a higher level of loan losses will tend to exhibit lower levels of risk-adjusted assets.

4. Conclusion

The study investigates the impact of business cycle fluctuations on bank capital buffer and portfolio risk. The dynamic panel data model with partial adjustments was estimated by using two-step GMM. The study concludes that bank capital buffer fluctuates counter-cyclically and it indicates that banks increase capital as economic conditions worsen. It is found that business cycle fluctuations have pro-cyclical, but insignificant impact on portfolio risk adjustments. Moreover, investments in government securities and non-performing loans have a significant impact on portfolio risk adjustments. There is a two-way inverse relationship between changes in absolute capital buffer and portfolio risk, running from risk to capital buffer and vice versa. The speed of adjustments in absolute capital buffer is higher than that of portfolio risk. There is a positive and significant impact of liquidity on adjustments in capital buffer and risk. Moreover, banks are typically better capitalized before a merger and when weakly capitalized banks are merged with healthy banks a decrease in capital buffer adjustments is expected in the year of merger. Conversely, merger has no significant impact on portfolio risk. The results show that capital buffer fluctuates counter-cyclical, In a recession period, the lending risks are increased; hence, with the increase in the risk profile of portfolio, the banks should have sufficient capital buffer built up at all time to protect themselves from defaults and to help lessen contagion risk in the economy and to fulfill the capital buffers requirement by the Basel III. However, due to the stress conditions in recession the banks' capital might decrease on account of booking of losses. The results are also confined to 2004-2014 study periods only mainly due to data limitations, although in Pakistan the banks started Basel Accord implementation in 1997, but they are often confidential and bank wise published data of capital adequacy ratio were not available before 2004. One of the novel contributions of this study, to the best of our knowledge, shows that banks have received comparatively lesser attention of assessment of effective capital regulations in risk-taking, specifically in the developing countries.

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Appendix

Panel 1: Fisher-type Unit-Root Test for ΔAbBUF

		Statistic	P-Value
Inverse chi-squared (72)	P	236.2916	0.0000
Inverse normal	Z	-8.2424	0.0000
Inverse logit t (159)	L*	-9.6257	0.0000
Modified inv. Chi-squaredPm		13.6910	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 2: Fisher-type Unit-Root Test for ΔRISK

		Statistic	P-Value
Inverse chi-squared (42)	P	93.2438	0.0000
Inverse normal	Z	-4.2403	0.0000
Inverse logit t (79)	L*	-5.7908	0.0000
Modified inv. Chi-squaredPm		5.5912	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 3: Fisher-type Unit-Root Test for $RISK_{t-l}$

		Statistic	P-Value
Inverse chi-squared (42)	P	123.7957	0.0000
Inverse normal	Z	-3.1236	0.0009
Inverse logit t (69)	L*	-7.2372	0.0000
Modified inv. Chi-squaredPm		8.9246	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 4: Fisher-type Unit-Root Test for SIZE

		Statistic	P-Value
Inverse chi-squared (72)	P	236.2916	0.0000
Inverse normal	Z	-8.2424	0.0000
Inverse logit t (159)	L*	-9.6257	0.0000
Modified inv. Chi-squaredPm		13.6910	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 5: Fisher-type Unit-Root Test for dyMerger

		Statistic	P-Value
Inverse chi-squared (72)	P	32.0099	0.0133
Inverse normal	Z	-2.2465	0.0123
Inverse logit t (49)	L*	-2.2258	0.0153
Modified inv. Chi-squaredPm		-3.3325	0.9996

P statistic requires number of panels to be finite.

Other statistics are suitable for finite or infinite number of panels.

Panel 6: Fisher-type Unit-Root Test for ROA

		Statistic	P-Value
Inverse chi-squared (72)	P	245.1230	0.0000
Inverse normal	Z	-6.0328	0.0000
Inverse logit t (154)	L*	-10.1247	0.0000
Modified inv. Chi-squared	Pm	14.4269	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 7: Fisher-type Unit-Root Test for NPL

		Statistic	P-Value
Inverse chi-squared (42)	P	142.9952	0.0000
Inverse normal	Z	-2.3397	0.0096
Inverse logit t (84)	L*	-6.4431	0.0000
Modified inv. Chi-squared	Pm	11.0195	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 8: Fisher-type Unit-Root Test for LLOSS

		Statistic	P-Value
Inverse chi-squared (48)	P	211.7246	0.0000
Inverse normal	Z	-5.4720	0.0000
Inverse logit t (89)	L*	-12.0799	0.0000
Modified inv. Chi-squared	Pm	16.7101	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 9: Fisher-type Unit-Root Test for Cycle Gap

		Statistic	P-Value
Inverse chi-squared (72)	P	59.6555	0.0485
Inverse normal	Z	-1.7125	0.0434
Inverse logit t (149)	L*	-1.5036	0.0674
Modified inv. Chi-squared	Pm	-1.0287	0.8482

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 10: Fisher-type Unit-Root Test for INV

		Statistic	P-Value
Inverse chi-squared (48)	P	74.0214	0.0093
Inverse normal	Z	-0.9804	0.1634
Inverse logit t (99)	L*	-1.5616	0.0608
Modified inv. Chi-squared	Pm	2.6558	0.0040

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Panel 11: Fisher-type Unit-Root Test for Liquid

		Statistic	P-Value
Inverse chi-squared (68)	P	105.1725	0.0026
Inverse normal	Z	-1.1580	0.1234
Inverse logit t (154)	L*	-2.2731	0.0122
Modified inv. Chi-squaredPm		3.1875	0.0007

P statistic requires number of panels to be finite.

Other statistics are suitable for finite or infinite number of panels.