Are Capital Buffers Countercyclical ? An Evidence From Pakistan

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New risk based capital requirement have pro-cyclical effect and causes negative externalities in the economy. During recession, on one side, quality of loan portfolio deteriorates and probability of default increases resulting into increased level of provisions and write off's and reduced capital level. This causes an increase in capital requirements which becomes more expensive. Weaker banks fail to access new capital and ultimately reduce the credit supply. On the other side, banks are required to maintain the minimum capital which results into credit supply contraction and hits the bank's profitability leading to a situation called Credit Crunch. This situation may prolong recession. During the crisis, developing countries are more affected than developed countries and this debate is entirely new in Pakistan. This research empirically investigates the pro-cyclical effect of new capital regulation under Basel II using panel data of 47 Pakistani Banks from

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2001-2012. Particularly this paper examines the capital management mechanisms using capital buffers, using Generalized Method of Moments (GMM) one step and two step estimation techniques on dynamic panel data model. The results gives evidence that capital buffer are counter-cyclical except in case of specialized banks because of difference in operations. The findings also suggest that adjustment costs, cost of raising capital and bankruptcy costs are major determines of holding capital buffer. Analysis confirms too big to fail hypothesis. Form the results, it is concluded that capital buffer are counter-cyclical, consistent with the hypothesis. The findings suggest the banks to adopt Basel III Accord.

Keywords: Basel II, Capital Regulation, Pro-cyclicality, Tier 1 Capital, Tier 2 Capital, Capital Buffer.
JEL Classifications: G21, G30

Introduction

Basel II capital regulation has become a central debate after the recent financial crisis. It raises several interrelated questions, such as; why capital regulation is imposed? How banks respond to these capital regulations? Is there any cost or benefit associated with it? And whether it is an efficient way to maintain financial soundness and stability of the financial sector?

Minimum capital requirement is imposed to provide a framework for the banks in order to tackle credit risk. In 1988, BCBS decided to propose capital management framework known as Basel Accords. The rationale behind setting the minimum capital requirement is to ensure the soundness and stability of banking sector. To maintain soundness and stability in financial sector, capital prevents the banks from insolvency, protects against the risk of loss from the bank's assets and helps to remove the liquidity problem. To comply with the capital regulations and to avoid the bankruptcy and penalty by regulators,

banks hold a larger chunk of capital which negatively impacts the banks' lending power.

Financial crisis is the root cause of recession in economy because all other sectors are associated to financial system. To enhance the soundness and safety of the banking industry, bank regulators imposed minimum capital requirement. Due to impositions of minimum capital adequacy requirement, "Banks had to hold more capital on the rainy day than they had had to hold against the rainy day".

The debate on pro-cyclical effects of regulatory capital is an important aspect about new bank capital regulations. This pro-cyclical effect of risk based capital is a source of financial instability. The cyclical effects of bank capital regulation are studied in the literature theoretically and empirically. Since, in downturn, specific provisions and write-offs increases, this would reduce banks' capital and force the bank to reduce new loans. Secondly, in the downturn, condition of borrowers deteriorates. Hence, borrowers are also unable to pay back the loans. Extra capital is to be set aside which results in capital shortage, also known as capital crunch. A capital crunch leads to the reduction of assets. The recent financial crisis has focused on pro-cyclicality in the financial sector. Moreover, it has been frequently argued that risk-based capital requirements introduced in Basel II, would induce further pro-cyclicality.

The modification of minimum capital adequacy regulation is a structural change. For one, the regulation stresses the importance of building up and maintaining the necessary capital, given the specific risk profile of each bank. For this purpose, Banks use different measures to offset this pro-cyclical effect of new capital regulation. One of them is holding capital buffers (excess of minimum capital requirements) which act as a protective cushion for unexpected credit losses in the period of recession.

To the best my knowledge, this is the founding study regarding the implementation of Basel II and issue of pro-cyclicality in Pakistani banking sector and provides fresh empirical evidence from a developing country. The main objective of this paper is to explore the issue of pro-cyclicality under Basel II in Pakistan using data set of all Pakistani commercial banks from 2001 to 2012. The paper also investigates whether capital buffer behave counter-cyclically in Pakistani banking sector. This research also explores major determinants of capital buffer. The paper also tests the entire hypothesis for different types of banks by ownership and bank size.

Forward-looking banks maintain countercyclical capital buffers to meet the regulatory capital requirements in the periods of recession. Because capital buffer act as a cushion against the unexpected credit losses, bank increase capital buffer in the periods of good economic conditions and utilize then in the period of recession.

H_1^1: Capital buffer held by Pakistani Commercial Banks, behave counter-cyclically under Basel II accord.

To hold countercyclical capital buffer, three types of costs are evolved, cost of adjustment, cost of raising new equity and cost of failure. Adjustment cost is the cost arises due to information asymmetry.

H_1^2: Adjustment cost, Cost of raising new equity and Cost of failure are a major determinants of capital buffer.

These are the main hypothesis to be tested in the next sections.

2. Are Capital Buffers Countercyclical?

One of the main lessons of the recent crisis is that bank capital is pro-cyclical and financial regulation that induces counter-cyclical capital buffers may enhance financial stability. There is a huge literature which studies pro-cyclicality through capital buffer and showed the negative as well as relation of capital buffer with business cycle. Some literature showed that capital requirements are not binding. Some empirical studies investigated that most of the banks hold capital buffers which are countercyclical. If banks increase the buffer in the period of

expansion and use them in recession, this will partially offset the pro-cyclical effect of capital regulation. In literature, there is another major finding is that holding capital buffers in the period of recession may enhance the financial stability.

Bank capital is important for banks' solvency. Capital buffers are maintained as a protective cushion to cover the unexpected losses and hence to avoid bankruptcy. The quality of loans deteriorates during economic downturn, which increases the risk and hence the probability of default. Banks needs more capital to cover unexpected losses and due to high demand, capital becomes more expansive. Banks may be force to decrease credit lending to its customers. There are three main reasons that why banks hold capital buffers, first capital buffer act as insurance, as to avoid costs that are related to supervisory intervention and market discipline. Second, banks hold buffers to signal to market as a solvent bank and to gain competitive position by raising funds at low interest rate. Third, capital buffers act as a protective cushion as they absorb the economic recessions. So, literature shows the links between capital buffer and economic cycle.

Capital buffer absorbs unexpected capital shocks and offset the negative effects of economic fluctuations. These negative shocks are due to credit risk which is positively related to business cycle. During recession credit risk increases and probability of default increases. A lot of studies showed a linkage of capital level with business cycle. In most of the countries, there is inverse relation between capital and business cycle. Estrella, (2004) investigated the relationship between optimal forward looking capital buffers and deterministic cycles of loan losses. Fonseca and González, (2009) also investigated bank and country determinants of capital buffer. The findings indicated a cost of deposit and bank market power is positively related to capital buffers. Accounting restrictions on bank activities and strict disclosure requirements would positively affect buffer. Jokipii and Milne, (2007) found similar negative relationship for 15 countries. Their results

showed a significant negative relation of capital buffer with business cycle by dividing banks into different samples and also explored the slow speed of adjustment towards desired capital level.

When capital buffer is positively related to business cycle, then buffer increases in expansionary phase and lowers in recessionary periods. In this case there is a probability that capital ratio will be less than minimum capital requirement and there are chances of bankruptcy. This behavior is also investigated in the literature and known as forward looking behavior. Banks build up capital during upturn when it is cheap and uses in the recession. Bikker and Metzemakers, (2004) explored major determinants of internal capital targets for commercial banks and its sensitivity with business cycle. The empirical evidence showed that more risk sensitive capital requirements may force banks to maintain high capital levels which further make it more pro-cyclical. Their findings also suggested that the banks should adopt forward-looking approach for the estimation of risk. Likewise, Ayuso et al, (2004) for Spanish Banks, Stolz and Wedow, (2005) for German banks by dividing samples according to bank type investigated the significant and relationship of capital buffer and business cycle. They found that fluctuations are stronger in the case of commercial banks as compared to commercial banks.

Well capitalized banks are able to mitigate the pro-cyclical effect of capital regulation. Less capitalized banks raise capital with low risk whereas well capitalized banks maintain their buffer with high risk. Jokipii and Milne, (2011) explored significant and positive relation between short term capital buffer and portfolio risk adjustment, consistent with the theory capital buffer theory. But for the less capitalized banks lose market confidence easily. However capital buffers act as cushion which is able to absorb unexpected credits shocks. Furfine, (2001) stated that banks hold buffers as insurance against the supervisory intervention (if it falls below minimum capital requirement) and cost of market discipline.

To check the importance of capital regulation in the capital and risk management decisions of banks, there are two main theories used in the literature, Moral Hazard Theory and Capital Buffer Theory. Moral Hazard theory states that when capital regulation forces the banks to increase capital levels, they will react also by increasing level of risk. On the other hands, Capital buffer theory states that bank behavior depends on the size of buffer they hold. Banks containing high capital buffers aims to maintain their capital buffer but the banks with low capital buffer aims to rebuilds the capital buffers. For the banks with high buffers, capital and risk adjustment are positively. On the other hand, for the banks with low buffers, there is negative relationship between capital and risk. Shrieves and Dahl, (1992) and Heid et al., (2004) explored that capital buffer theory in the case of German saving banks. Ahmed et al., (2016) have found that the counter cycle buffer is appropriate indicator for Palestine bank sector. They have also mentioned that change in the capital reserve cannot effect the GDP in Palestine.

3. Reasons for Holding Capital Buffer

There are several reasons that why banks hold excess capital buffers (Estrella 2004), Jopki & Milini, (2008). First, Bank may hold capital buffer in order to protect itself against the violation of minimum regulatory capital requirements. Second, banks hold buffer to get growth opportunities in future. Third, banks hold buffer to satisfy the credit rating agencies and to show good financial health in the market. Fourth, buffer also act as insurance for the banks against unexpected shocks (Nier and Baumman 2006). Excess Capital reduces the costs of financial distress (Fonseca and Gonzalez 2008).

The findings of Estrella, (2004) suggested that banks hold capital buffer to anticipate credit losses, subject to capital adjustment cost. It is also argued that banks do not build up capital buffer but expand their portfolio during upswing. But in the next downturn, banks couldn't absorb credit risks. Hence, banks will be forced to reduce

their lending (Koopman et al. 2005; Stolz and Wedow 2005); Jokipii and Milne 2008). With a change in capital requirements, banks will be unable to adjust risk and capital instantaneously. The reason is that adjustment cost is associated with the issue of new external capital and the common stock will be reduced. Theoretical analysis (Mayers 1984) suggested that equity is more costly than debt. Hence cost of raising equity is also a major determinant of holding capital buffer.

4.Determinants of Capital Buffer

Previous literature found that there are three major determinants of holding capital, cost of raising capital, cost of holding capital and cost of failure. Almost all studies found these three major determinants along with bank size (for too big to fail). Jackson et al., (2002), Bikker and Metzemakers, (2005), and Jokipii and Milne, (2007) investigated that banks prefer to hold buffers for safety purposes in order to signal the market about their solvency. For a well solvent bank, it is easier to raise equity. Rime, (2001) focused mainly on the capital and risk adjustment and found significant positive relationship of change in risk with change in capital ratio for Switzerland banks and concluded that capital level should change to absorb fluctuations in risk over the time. Chen and Hsu, (2011) investigated that the banks used tier 2 capital to raise capital and explored that banks don't have enough capital to absorb losses in the downswing. They explored the negative relation of business cycle with common equity along with capital buffers. In developed markets, cost of raising tier2 capital is less than common equity.

4.1 Adjustment Cost

This paper takes into account the cost of capital adjustment. Changes in level of capital are associated with the cost of adjustment. The reason for adding adjustment cost in the model is information asymmetry problem in capital markets. Raising new equity signals negative information to capital market because the issuer has the informational incentive over buyers as they considered the price of

share above its fair value, which will increase the cost of adjustment. For such purpose, it motivates for holding high level of capital in order to mitigate the cost of adjustment. Myers and Mayer, (1984) find out the cost of adjustment as a determinant for holding capital buffer, in the case when banks are required to use external capital to accumulate it to existing internal capital. Theil, (1971) states that, "Actual capital level adjusts gradually over time towards its optimal model value". This will be indicated by the speed of adjustment.

4.2 Cost of Financial Distress

High capital reduces the non-compliance risks and cost of failure that has a direct relationship with negative (and absolute terms) net worth of bank failure (Milne and Whalley 2001). Maintaining the high capital levels ensure that the bank capital will not fall less than minimum required capital, this will reduce the probability of bankruptcy and failure costs (loss of charter value, legal costs and reputational costs).

4.3 Cost of Funding

Another major determinant of holding capital buffer is discovered by Myers and Mayer (1984) and Campbell, (1979) which suggested that equity is more costly than debt. The reason behind this is tax shield benefit associated with the debt. Jopki & Milne, (2004) suggested that high level of earnings act a substitute to cover unexpected losses for financially strong banks. This revenue impact causes the negative relation of capital buffer with cost of funding.

5.Theoretical Framework

A bank's capital buffer is given by the capital banks hold in excess of the regulatory minimum capital requirement. Hence, banks' capital buffer is defined as the Basel capital to risk-weighted assets ratio minus the 8% regulatory minimum.

The behavior of banks' regulatory capital ratio over the business cycle may reveal important information for supervisors about banks' lending behavior and financial stability. Shocks to banks' capital may force banks to raise capital and reduce lending. The main source of

capital shocks are credit losses, which are potentially rising in business cycle downswings. Hence, the expected credit losses increases in economic downturns and decreases in economic upturns. Given this behavior of credit losses, a forward-looking bank is expected to build up capital buffer in economic upswings. However, if banks fail to anticipate the behavior of credit losses, they expand their loan portfolio in an economic upturn without building up their capital buffer accordingly. In this case, when the economic downturn sets in, banks' capital buffer cannot absorb the materializing credit risks. Consequently, banks may have to increase their capital buffer ratio through a reduction in risk-weighted assets, which may happen through a reduction in lending activities.

To examine the relation between capital buffer and business cycle, this paper follows the theoretical model given by Ayuso Juan et al., (2004). They started the theoretical framework with the simple equation of single bank which describe the dynamics of capital stock.

$$K_t = K_{t-1} + I_t \qquad (3.1)$$

Where K_t is capital level at time period t, which depends on K_{t-1} (capital level at the end of period t-1) and I_t which represents stock issues or repurchases and retained profit at time period t.

Estrella, (2004) keeping in view the major determinants for holding capital buffers and proposed theoretical and empirical model. First is cost of holding capital which is direct cost of holding excess capital. Due to high cost of equity funding, direct cost increases. Return on Equity is used to reflect the direct cost of excess capital. Second type of cost of holding capital is cost of failure which is also called bankruptcy cost. Non-performing Loan ratio reflect the risk profile and it is used for the proxy of cost of failure. Third type of cost is cost of adjustment which is captured by first lag of dependent variable according to partial adjustment model. In line with Estrella and Ayuso et al. also used lagged dependent variable to capture the cost of adjustment. This is so called Koyck Lag Model. The cost of

adjustment is related to problem of information asymmetry on the capital markets. All these three types of costs are inserted in the following equation.

$$C_t = (\alpha_t - \gamma_t) K_t + \frac{1}{2}\delta_t I_t^2 \quad (3.2)$$

Where, α_t shows the cost of remunerating the capital, γ_t reflects the costs of failure and δ_t represents the existence of adjustment costs. For simplicity, linearity in remunerating and failure cost and asymmetry in adjustment cost is assumed.

Now, the representative bank minimizes it's inter temporal costs by solving the following cost minimization problem;

$$\underset{\{I_{t+1}\}_o^{\infty}}{Min} E_t \sum_{i=o}^{\infty} \beta^i C_{t+i} \quad (3.3)$$

$$s.t \quad C_t = (\alpha_t - \gamma\ t) K_t + \frac{1}{2}\delta_t I_t^2 \quad (3.4)$$

$$K_t = K_{t-1} + I_t \quad (3.5)$$

By applying the Langragian function and first order condition gives the value of I_t,

$$I_t = E_t\left[\frac{1}{\delta_t}\sum_{i+o}^{\infty}\beta_i(\gamma_{t+1} - \alpha_{t+1})\right] \quad (3.6)$$

Now plug in the value of I_t in capital equation 3.5, and apply expectation

$$E_t(K_t) = K_{t-1} + E_t\left[\frac{1}{\delta_t}\sum_{i+o}^{\infty}\beta_i(\gamma_{t+1} - \alpha_{t+1})\right] \quad (3.7)$$

The regulatory minimum capital is now be subtracted from both sides and the expected capital replaced by the actual capital and expectation error. Now we get the following equation.

$$(K_t - K^*)_t = (K_t - K^*)_{t-1} + E_t\left[\frac{1}{\delta_t}\sum_{I=0}^{\infty}\beta^i\gamma_{t+1}\right] - E_t\left[\frac{1}{\delta_t}\sum_{I=0}^{\infty}\beta^i\alpha_{t+1}\right] + \varepsilon_t \quad (3.8)$$

Now, last equation (3.8) clearly shows that capital buffer depends on three types of costs mentioned above. Accordingly, to estimate the effects of the position in the cycle on the capital buffer consistently,

this paper controls for the effects of -i.e. to include in the RHS of our empirical equation- i) lagged dependent variable, which captures the relevance of adjusting costs and should therefore have a positive sign; ii) variables related to the (expected) costs of remunerating capital, which should have a negative sign; and iii) variables capturing the (expected) bank failure costs for the bank, which are linked both to the bank's attitude towards risk. By looking the best proxies from equation (3.8), which are most relevant with the paper, are plugged in the final equation.

To test the hypothesis of capital buffer, using empirical model of Ayuso Juan et al., (2004), following equation is constructed, in which Capital Buffer is dependent variable and lag of dependent variable is added to capture the cost of adjustment, return on equity is a proxy for cost of holding capital, risk is added to capture the cost of failure.

$$Buffer = \beta_0 + \beta_1 ROE_{i,t} + \beta_2 Risk_{i,t} + \beta_3 Buffer_{i,t-1} + \varepsilon_{i,t} \quad (3.9)$$

Coefficient of Buffer also shows the speed of adjustment. A large coefficient of capital buffer means that speed of adjustment is slow and vice versa. Size is added as control variable and to test the too big to fail hypothesis which states that whether practice of holding capital buffer is same in small and large sized banks. GDP is included in the model to examine the additional effect of business cycle on capital buffer held by the banks and to test whether banks hold buffer or not in good economic conditions. The final equation is

$$Buffer = \beta_0 + \beta_1 ROE_{i,t} + \beta_2 Risk_{i,t} + \beta_3 Buffer_{i,t-1} + \beta_4 Size_{i,t} + \beta_5 GDP + \eta_i + \varepsilon_{i,t} \quad (3.10)$$

Whereas Capital buffer is measured by Tier 1 Capital Ratio minus minimum regulatory capital requirement. ROE is ratio of Profit after tax to Total Equity. Risk is measured by Non-performing Loan to Total Assets. Size is measured by Log of Total Assets. ε_{it} is a standard random shock and it is iid with mean zero and constant variance. The variables of size and business cycle are considered to be exogenous and therefore used as their own instruments.

Positive and significant coefficient of cost of adjustment will prove that adjustment costs are significant determinant of capital buffer. The significance, sign and magnitude of β_5 will allow us to answer the main questions of pro-cyclicality. A positive relationship between capital buffer and business cycle will indicate that banks hold capital buffer as a precautionary cushion to offset the effects of pro-cyclical capital requirements. But a negative relationship between capital buffer and business cycle means that capital buffers are pro-cyclical.

6.Methodology

This paper is based on the data collected from Financial Statement Analysis published by State Bank of Pakistan for all 47 banks, incorporated in Pakistan and listed at KSE since 2001 for the period 2001-2012. The sample includes all Pakistani commercial banks including public banks, private banks, specialized banks, Islamic banks and foreign banks. No mergers and acquisitions are accounted for.

The paper used generalized method of moments (GMM) first differences estimators developed by Arellano and Bond, (1991) for dynamic panel data models. GMM can address relevant econometric issues using this approach i.e. Autoregressive behavior of loan loss provisions, potential endogeniety problem of explanatory variables and unobserved bank specific effects. This approach is also suitable for unbalanced panel data and covers the problem of heterogeneity and endogeniety while OLS generates biased results in this regard. This approach requires the number of cross section should exceed the time series observations. Laeven and Majnoni, (2001); Cavallo & Majnoni (2002); Ayuso et al., (2004); Ghosh and Nachane, (2003), Liebig et al., (2004); Bouvatier and Laetitia, (2007); Perez et al., (2008); Jokipii, (2011); Ahmed et al., (2015) and many others used this estimation technique.

7.Results and Discussion

Using the data of all Pakistani commercial banks from 2001 to 2012, this section discusses the results of capital buffer equation (Eq. 3.8) and provides the evidence whether Pakistani commercial banks use countercyclical capital buffer to mitigate pro-cyclicality to some extent. Further this section also provide the evidence whether all three costs relevant to capital buffer. The dependent variable is capital buffer against cost of holding capital, cost of adjustment and cost of failure as explanatory variables along with bank size and GDP (control variables).

Table 1 shows the details of descriptive statistics of the dependent and explanatory variables in the estimation sample. The results shows that on average, banks hold 0.03% (with a standard deviation of 0.89%) capital buffer in order to meet unexpected shocks. There is excess kurtosis almost in all variables. BUFFER, SIZE and GDP are negatively skewed. ROE and NPLTL are positively skewed. The results showed that most of the banks hold assets and capital buffer less than the average.

Table 1

Descriptive Statistics

Variables	Mean	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis
BUFFER	0.0267	5.8950	-5.4115	0.8928	-1.0788	27.7355
ROE	0.1989	40.0129	-14.7427	2.5145	11.7218	188.6722
NPLTL	0.1402	0.9862	0.0000	0.1815	2.5870	10.2556
SIZE	17.9581	21.1996	14.7109	1.4487	-0.0033	2.1783
GDP	7829952	9863235	3745118.	2031812	-1.13944	2.701787

Table 2 represents the results of panel unit root test and provides the evidence that all variables are stationary at 1% level of significance.

Table 2

Panel Unit Root Test

Variables	LLC Test Stat
BFFER	-12.5328***
ROE	-105.241***
NPLTL	-10.2888***
SIZE	-9.14092***
LGDP	-4.95482***
Note: *** shows significance at 1%.	

Table 3 represents the correlation matrix of the all the variables in the estimation, especially correlation among explanatory variables. All the coefficients are less than 0.50. This indicates that there is no problem of multi-co linearity.

Table 3

Correlation Matrix

	ROE	NPLTL	SIZE	LGDP
ROE	1.0000			
NPLTL	0.0133	1.0000		
SIZE	-0.0449	-0.3838	1.0000	
LGDP	-0.1290	0.0383	0.2721	1.0000

7.1 Overall Banking Sector

Table 4 reports the results of the model after applying two step GMM estimators with and without foreign and Islamic banks. Foreign and Islamic banks are excluded from the overall analysis in column 1 to avoid econometric problems because most of data for these banks is available from 2006.

Ayuso et al., (2004) found NPLTL and ROE are endogenous. So in this paper Durbin-Wu-Hausman (DWH) test is applied to verify the repressors include endogenous variables. Then, Sargan Test (for over identifying restrictions) is applied to confirm that instruments are not correlated with the error term. The m2 statistic is applied to test that

there is second-order serial correlation in the first-difference residuals. These are the conditions for the consistency of GMM estimator. Size and GDP are exogenous variables.

Table 4 contains the results of robustness testing. DWH Test found that ROE and NPLTL are endogenous variables. Sargon test showed satisfactory results having value greater than 0.05 in all models. There no serial 2nd order autocorrelation and the disturbances are white noise at first level. The results of Wald Test reveals that all variables are jointly significant as well as all time dummies are also jointly significant.

Table 4

Evidence of Pro-cyclicality of new Capital Regulation under Basel II
(Dependent Variable = BUFFER, Banking Sector (with and without Foreign and Islamic bank)

Variables	Excluding Foreign & Islamic Banks	Overall Banking Sector
BUFFER(-1)	0.7034*** (0.0028)	0.6385*** (0.0001)
ROE	-0.0030*** (0.0000)	-0.0055*** (0.0001)
NPLTL	-0.0418*** (0.0010)	0.3126*** (0.0001)
SIZE	-0.0042*** (0.0008)	-0.0178*** (0.0007)
GDP	0.0181*** (0.0017)	0.0127*** (0.0004)
DWH Test Stat	ROE	-17.3914***
	NPLTL	12.5246***
Wald Test (coefficients)	54734.16***	26624.18***
Wald Test (Time period)	6449.728***	-
m_2 Stat	31.47226***	59.1541**

*, ** and *** shows significance at 10%, 5%, and 1% respectively. Standard Errors are in parentheses.

The coefficient of lagged variable in Table 4 represents the speed of adjustment. When δ is high, the coefficient of lagged dependent variable is also high representing a slow speed of adjustment (1-δ). The coefficient of BUFFER(-1) is 0.7034 showing that adjustment cost is highly significant and positive as expected. This sign indicates that the lagged dependent variable exhibits positive coefficients confirming that the speed of adjustment to target capital level is slow. This shows that, after shocks, information adjust slowly and model started to converge towards equilibrium within six months. The results are consistent with the findings of Ayuso et al., (2004); Bikker and Metzemakers, (2004); Stoltz, (2005); Lindqvist, (2004) and Jokipii Milne, (2006).

The coefficient of ROE is negatively significant as expected. 1% increase in cost of holding capital will reduce the capital buffer by 0.003%. This negative sign is an indication that banks will reduce buffer as capital becomes more expansive. During the period of recession, capital becomes more costly which might force the banks to reduce their lending further prolong recession. It is also stated that cost of raising new capital is higher than cost of debt. This is because of tax shield benefit in raising capital through debt. The results are in line with the findings of Ayuso et al., (2004), Bikker and Metzemakers, (2004); Stoltz, (2005); Lindqvist, (2004); Jokipii Milne, (2006).

NPLTL is also negative and highly significant. It shows that in order to avoid the bankruptcy which can arise due to failure of the banks to fulfill minimum capital requirement, banks increase their capital buffers. During downswing, raising new equity is costly and there is probability that capital ratio will fall below minimum capital requirements and chances of bankruptcy, hence bank increase capital buffers. On the other hand when there are chances of bankruptcy or the probability that if minimum capital requirement falls below 8%, banks hold capital buffer in order to avoid cost of failure.

The coefficient of SIZE is negatively significant. Capital buffer theory states that large banks hold low buffer. When bank's asset increases, they reduce the capital buffers. The result is consistent with the theory as well as the findings of Ayuso et al., (2004), Bikker and Metzemakers (2004); Stoltz, (2005); Lindqvist, (2004); Jokipii & Milne, (2006).

The coefficient of LGDP is statistically significant and positive as expected and consistent with the findings of Ayuso et al., (2004); Bikker and Metzemakers, (2005). The positive relation implies that banks try to rebuild capital buffers in order to full fill the increase in capital requirements in the next downswing. This positive co moment shows a forward looking behavior of the bank as they use counter-cyclical capital buffers. A bank with forward looking approach, build up capital buffer at a cheaper rate during upturn to offset the negative effects of next recession. Results showed that Pakistani commercial banks build capital buffer in good times as a precautionary measure to offset pro-cyclical effects of capital regulation in the downswing.

7.2 Impact of Islamic and Foreign Banks

The results in column 2, Table 4 gives the estimation results after adding the Islamic banks and foreign banks in order to check whether Islamic banks and foreign banks have same patterns of holding capital buffers. There is no significant difference found in the results of ROE, SIZE and LGDP. But the results of BUFFER(-1) and NPLTL are significantly different.

The speed of adjustment (represented by BUFFER) is fast in column 2 as compared to column 1 after adding foreign and Islamic banks. This shows that foreign and Islamic banks are also following minimum capital requirement and increasing their capital base quickly. They have easier access to capital market. There is no significant difference found in the ROE. ROE is significantly negative meaning that when capital becomes more expansive banks reduce their capital holdings.

NPLTL is positively significant after adding Islamic and foreign banks. Foreign and Islamic banks have high capital levels and their capital requirements are slightly different than other banks. The results are supported by the argument that Tier1 capital ratio has been increased from 14% to 22.5% in year 2009 where the overall banking industry showed 11.6% tier1 capital ratio.

SIZE is negatively significant as expect and consistent with the literature meaning that large banks don't need to hold capital buffers because they are too big to fail. LGDP is also positively significant, meaning that capital buffers are countercyclical. During upswing, banks increase capital buffers and use them in recession.

Conclusions

This paper empirically examined the cyclical implications of Basel capital regulation in Pakistani Banking Sector using sample period 2001 to 2012. For extensive analysis, the paper explored how banks manage their capital levels and major determinants of holding capital buffer and lastly investigated whether Pakistani commercial banks use countercyclical capital buffers.

Analysis suggested that Cost of raising new equity, cost of failure and adjustment costs are the major costs associated with capital buffer, consistent with the literature and hypothesis. The negative relation of capital buffer with bank size confirms too big to fail hypothesis. On the other hand, the positive relationship between capital buffer and business cycle is also consistent with capital buffer hypothesis that capital buffers behave counter-cyclically. The results are same even after adding the foreign and Islamic banks. The analysis of large and small banks gives the evidence for too big to fail hypothesis. Bank size is negatively related to capital buffer for large banks and positively related for small banks.

On the basis of results, it is concluded that capital buffers are counter-cyclical. And, Cost of raising new equity, cost of failure and adjustment costs are the major determinants of capital buffer. For

policy implications first, the analysis suggests the banks to hold countercyclical capital buffers but up to certain limits because huge capital holdings may affect the profitability, efficiency and the effectiveness of banking operations. So, if regulator set a minimum amount of holding capital buffer, the pro-cyclical effect of capital regulation can be mitigated to some extent in a safe and sound manner. Secondly, the paper also suggests the regulators to implement Basel III in which new clause proposed to hold certain amount of capital buffer as Tier 3 capital.

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