DO MACROECONOMIC AND BANK SPECIFIC FACTORS AFFECT CAPITAL BUFFER: CASE OF PAKISTANI BANKS

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ABSTRACT: *Capital buffer requirement is becoming a popular topic in empirical literature. With reference to Pakistan, we want to analyze the behavior of capital which is over and above the minimum requirement (8% of risk weighted assets). Particularly, the factors which are affecting this capital buffer (over and above the minimum requirements). Balanced panel data has been used for 25 Pakistani Islamic and conventional banks. The data is from the year 2006 to 2012. There was no minimum capital requirement from State Bank of Pakistan prior 2006 against the risk weighted assets. Applying the Generalized Method of Moments (GMM) as estimation technique, which is more appropriate and flexible, the results are almost similar to those found in the literature. The results show that Pakistani banks are forward-looking i.e. they are building up their capital in economic upturns and as suggested by Basel Accord.*

Keywords: *Basel Accord, Bank Regulations, Capital Adequacy Ratio, Capital Buffer, Generalized Method of Moments (GMM).*

1. INTRODUCTION

In 1988, the Basel Committee introduced a new framework for prudential standards for banks that is often referred to as the Basel Capital Accord. The 1988 Accord set minimum risk-based capital requirements (8%) for internationally active banks. Since 1988, this framework has been progressively adopted in nearly all countries with significant banking systems. As a result, the principal prudential requirements on capital adequacy and licensing requirements have reached a high degree of uniformity across countries. Adequate Capital is necessary to ensure that the banks have sufficient Capital buffer to absorb expected and unexpected losses and the chance of a bank failure is reduced to the minimum. In order to ensure the long term viability of institutions, it is important that they not only maintain capital well above the minimum capital requirements but also institute a robust risk management framework covering all major risks the institution is exposed to. Since there is a relationship between the amount of capital required and the effectiveness of bank's risk management and internal control processes, there should be a process of capital allocation based on institution's internal risk assessment and overall risk appetite. Using generalized method of moments (GMM), proposed by Arellano and Bond [2], as estimation technique, the results are quite similar to the other studies related to capital buffer. The positive relationship between capital buffer and GDP growth indicate that Pakistani banks are forward-looking i.e. they are building up their capital in economic upturns. Among the other interesting results, result for RISK indicates that banks are not sensitive to their risk level. As the theory suggests that a bank should increase its capital with the increase in risk level but Pakistani banks are not taking care of their risk level.

1.1 Objectives of the Research: This study aims to find the relationship between bank capital buffer and macro-financial variables. The hypothesis is developed as:

HA: *Macroeconomic and bank specific factors affect the capital buffer in banking industry of Pakistan.*

2. LITERATURE REVIEW

The capital regulation has increasingly become an important measure for the safety of savings. Rochet [21] describes that the regulations, regarding capital, ensure providing an excess of capital during economic downturns along with preventing the banks from taking excessive risk. Lindquist [16] considers that capital buffers are to absorb the shocks whether expected or unexpected when the bank is facing costs from low level of capital and the cost of raising external capital is high. Due to this low level of capital, reputation and the confidence in the market can easily be lost. That is why Furfine [9] has mentioned that the capital buffer held by banks can act as an insurance to save the bank from regulatory intervention or market discipline if the level of this insurance reaches at or below the minimum. There are many other reasons for this buffer, Berger et al., [6] concludes that these are the market driven forces which make banks to have buffer even at the time when the cost of capital is relatively high, because capital buffer promises the bank to collect deposits at lower rate as there is no need for deposit insurance. Jokipii and Milne [14] are of the view that a bank with a low level of capital can lose the market share, at the time when there is an increased demand for loans, as compared to the bank with sufficient level of excess capital.

The ground breaking article on the capital requirements by regulators was written by Rochet [21] for European saving and commercial banks. Then consequently different studies have been conducted on the behavior of capital buffers. Ayuso et al., [3] while using the panel data from 1986-2000 of Spanish commercial and savings banks, have empirically estimated an equation for the behavior of capital buffers i.e. whether there is a relationship between capital buffers and business cycles. Pederzoli and Torricelli [20] have investigated the capital requirements which change by changes in the business cycle regimes. They have assumed that business cycle or GDP growth is partly predictable. Thus using the quarterly data of US banking firms from

1971-2002, they have found that capital requirements are risk sensitive i.e. they can produce pro-cyclical effects.

Heid [12] has very effectively pointed out and added to the discussion of capital buffers that why these buffers tend to move in an anti-cyclical way? Secondly, he has tried to argue that it is not necessary for capital to exhibit a pro-cyclical behavior under Basel II capital accord. Then a macroeconomic impact of Basel II has been explained which most of other studies have not discussed before like the impact of Basel II on Monetary Policy. Jokipii and Milne [14] have addressed the issue of pro-cyclicality of bank capital buffer and Basel II capital standards. Using the unbalanced data of 486 European banks from their balance sheets from 1997-2004, they tried to find out the relationship between capital buffer and the economic cycle under the old Basel accord of 1988 capital standards controlling for other potential variables of bank capital buffer, they focused on the effect of GDP growth on the capital buffer held by the European banks. Fonseca & Gonzalez [11] have estimated the determinants of capital buffer held by banks in seventy countries by using a panel data of 1337 banks. The sample period is from 1995 to 2002. They have contributed the literature by considering the market discipline. The effect of market discipline on capital buffers has been estimated by considering the relationship between cost of deposits and capital buffers.

Coffinet et al., [7] by using the yearly panel data at firm level from 1993-2009 for French banks have studied the relationship between capital buffers, loan growth and GDP growth. The study has been conducted after the financial crisis when a number of flaws or weaknesses arose in banking operations and regulations. Especially, the Basel II capital standards in which the banks are required to raise the capital in economic recessions, when it becomes difficult for banks to meet such requirements. Shim [22] while addressing the issue of cyclicality of capital buffer and risk adjustment decisions of US bank holding companies using their balance sheet data from 1992-2011, have found that the decisions regarding capital buffer and risk adjustment are taken simultaneously by the management.

3. RESEARCH METHODOLOGY

The data is a balanced panel taken from the annual reports of respective banks. It is from the period 2006-2012 which is a total of 7 years. The reason for starting from 2006 is that there was no such requirement for CAR (Capital Adequacy Ratio) prior 2006. Although the Basel I & II had put a minimum of CAR at 8% but State Bank of Pakistan did not make it mandatory before 2006. In October, 2005 the State Bank of Pakistan issued a circular, which is circular no. 6, in which it was made mandatory for public and private banks to keep a minimum of 8% of the risk weighted assets. That's why we have chosen the year 2006 as our starting year. A total of 25 banks were selected on the basis of data availability. These include Askari Bank, Albaraka Bank, Allied Bank, Bank Alfalah, Bank Islami, Bank Al-Habib, Bank of Punjab, Burj Bank, Dubai Islamic, Faysal Bank, First woman Bank, Habib Bank Ltd, Habib Metropolitan Bank, JS Bank Ltd, KASAB Bank, Muslim Commercial Bank (MCB), Meezan Bank, National Bank, NIB Bank, Samba Bank, Silk Bank, Soneri Bank, Standard Charterd Bank, Summit Bank and United Bank Limited (UBL). The variables are defined in Table 1.

Table 1: Definitions and Data Sources

Variable	Definition	Data Source
Capital Buffer (BUF_{it})	It is the amount of capital which is over and above the minimum requirements set by the central bank. The minimum requirements set by the State Bank have been changing over time, for instance the CAR for the years 2006-2008 was 8% and I have depleted the CAR of the bank by 8% for these years, then for 2009-2010, it was 9% and for 2011-2012 it was 10%. So I have depleted the CAR according the requirements. It is computed as BUF_{it} = CAR_{it} – Minimum requirement set by the central bank	Annual Report
Return On Equity (ROE)	ROE has been used as the proxy for cost of capital i.e. the opportunity cost of capital. The rationale for using this proxy is that The holding of excess capital means that the bank is facing a direct cost as the capital has to be remunerated. It is computed as: ROE = Net Profit after tax / Total shareholder's equity × 100	Annual Report
RISK	In order to capture the risk appetite of a bank, Risk weighted assets (RWA) to total assets has been adopted as the proxy for RISK of the bank. It has been computed as: RISK = RWA/Total Assets	Annual Report
GDP Growth	The macroeconomic indicator i.e. GDP growth, also a determinant of capital buffer, is included in the model in order to see the effect of changes in the economic activity on capital buffer.	WDI
Size of the bank (SIZE)	SIZE of the bank has been used as a determinant of capital buffer. It is computed by taking the natural log of total assets of the bank. SIZE = ln(Total Assets of bank)	Annual Report
Share of Bank's assets (SBA)	Share of bank's assets means the share of a bank's assets in the total assets of banking system. The rationale of including this variable is that the market power of the bank makes him capable of keeping the optimal level of capital buffer. It is computed as: SBA = (total assets of the bank / Total assets of the banking system)×100	Annual Report
Loan Growth (LOANG)	It indicates the growth in total loans. In other words we can say that it shows the incremental loan. It has been computed as: LOANG = $(\text{Total amount of loans})_{it}$ - $(\text{Total amount of loans})_{it-1}$	Annual Report

Using GMM as estimation technique proposed by Arellano and Bond [2] which is a general framework for developing estimates that provide an estimation framework which

include least squares, nonlinear least squares, instrumental variables, and maximum likelihood, and a general class of estimators. For more recent applications of GMM in similar veins, see Elahi, Mehmood, & Awan [17]. This technique is used for dynamic models to get unbiased estimates where lagged dependent has also been used as an explanatory variable. The following equation for determining the level of capital buffer is used.

$$BUF_{it}=\omega(BUF_{i,t-1},ROE_{i,t},RISK_{i,t},GDPG_t,SIZE_{i,t},LOANG_{i,t},SBA_{i,t})BUF_{it}=\alpha_i+\alpha_1(BUF_{i,t-1})+\beta(ROE_{i,t})+\gamma(RISK_{i,t})+\delta(GDPG_t)+\kappa(SIZE_{i,t})+\lambda(LOANG_{i,t})+\zeta(SBA_{i,t})+\varepsilon_{,t}$$

i = 1, 2, 3…N (Number of banks) t = 1, 2, 3 … T

3.1 Theoretical Justification of the Model

In order to estimate and check the behavior of capital buffer over time, most of the studies undertaken particularly of this type have used a linear equation model by incorporating different bank specific and other variables. Ayuso et al., [3] has used linear equation to estimate the behavior of buffer capital over the business cycle. They have established a linear relationship specifically to use the GMM as estimation technique. Other studies are conducted by Pederzoli and Torricelli [20]; Jokipii and Milne [14] and Fonseca & Gonzalez [11] who have used similar type of regression equation focusing on the subject matter. So this model represents at the same time an equation for behavior of capital buffer over time as well as the factors affecting the level of capital buffer.

The dependent variable is capital buffer (BUFi,t) and the explanatory variables are lag of capital buffer (BUFi,t-1) to see that whether the amount of capital buffer for previous year has any effect on the current level of capital buffer. This variable also shows the adjustment cost of capital.

Table 4:GMM Estimates
Dependent Variable ($BUF_{i,t}$)

	Coefficient	z-statistic	p-value
$BUF_{i,t-1}$	0.3176	2.20	0.028
GDPG	0.7026	2.74	0.006
SIZE	-0.3060	-2.98	0.003
ROE	0.0064	5.16	0.000
SBA	0.0258	2.21	0.027
RISK	1.9154	1.27	0.206
LOANG	-0.0125	-2.45	0.014
Other Tests and Parameters			
Observations = 85			
No. of Banks = 25			
Instruments = 21			
Wald χ^2 = 785.10 [p = 0.000]			
p-value of Hansen J-Test = 0.707			
M_1: p = 0.049 &**M_2:** p = 0.881			
Source: Author's estimations			

Return on equity (ROEi,t) will indicate the opportunity cost of capital as capital has to be remunerated. Risk weighted assets to total assets as a measure of risk (RISKi,t). There are some other proxies which can be used to capture the risk appetite of the bank but the proxy which we have used is widely used in the literature and it shows a closer look in the risk of the bank. GDP growth (GDPGi,t) has been used to see the effect of macro level changes like change in the GDP of the country. Size of the bank (SIZEi,t) has been used to observe that if SIZE of the bank (large or small) affects the level of capital buffer or not. Share of bank's assets in total banking system assets (SBAi,t) and loan growth (LOANGi,t).

4. RESULTS & INTERPRETATION

Pre-estimation Results

4.1 Tests for Endogeneity

The problem of heteroskedasticity and endogeneity can exist in the regression analysis. So to cope with these two problems separate tests for endogeneity and heteroskedasticity have been performed. Table 2 shows the two tests for endogeneity. The Wu-Hausman F test is statistically significant at 10% level of significance. Durbin-Wu-Hausman is statistically significant at 5% level of significance showing the presence of endogeneity in instrumental variables.

Table 2: Test for Endogeneity

H_0: Regressor is exogenous	
Wu-Hausman F test	F(1,121)=3.915 {0.050}
Durbin-Wu-Hausman	$\chi^2(1)$= 3.886 {0.049}
Note: Values in {}are the probability values	
Source: Authors' estimations	

5.2 Tests for Heteroskedasticity

As per Baum et al., (2003) presence of heteroskedasticity in IV regression calls for GMM estimator. Following tests are applied for inquiring the suitability of GMM in this case. In the table 3, result of Breusch–Pagan/Godfrey/Cookweisberg,White/Koenker nR2 test statistic, Pagan-Hall test with assumed normality and Pagan-Hall general test statistic are statistically significant at 1 % level of significance. Therefore the presence of heteroskedasticity cannot be ruled out and GMM estimator should be adopted for.

Table 3: Test for Heteroskedasticity

Ho: Disturbance is Homoskedastic	
Pagan-Hall general test statistic	24.153***
Pagan-Hall test w/assumed normality	79.591***
White/Koenker nR^2 test statistic	24.584***
Breusch-Pagan/Godfrey/Cook-Weisberg	81.447***
***shows statistical significance at 1%**	
Source: Authors' estimations	

4.3 Interpreting the GMM Results

The Wald test which shows the overall health of the model is significant which means that model is rightly specified. The number of groups (25) in the regression is greater than the number of instruments (21) and also the number of observations (85) is also larger than the number of instruments.

Lagged variable of capital buffer (BUFi,t-1) has coefficient (0.3176) with p-value of 0.028. It shows that the model is dynamic in nature which supports the selection of GMM as estimation technique. It shows that there is lagged dependence in the model with reference to BUFi,t. Roodman (2009) suggests that the coefficient for lagged dependent

variable should be less than 1 in absolute value. Its coefficient indicates that a 1 unit increase in BUFi, t-1 will result in a 0.3176 unit increase in capital buffer. Another interpretation of the coefficient BUFi, t-1 is that it shows the adjustment cost which the bank has to face in order to meet minimum requirement. Fonseca and Gonzalez [11] suggest that the positive sign of the coefficient will surely indicate the adjustment cost for capital buffer. With other benefits of capital buffer, another benefit of having this buffer is that the banks will not face any difficulty in adjusting the capital to meet the requirement [13]. In this case we can infer that in order to increase 1 unit of capital buffer, the bank has to face 0.3176 units as cost of adjustment. There are some other studies like Ayuso et al., [3] and Estrella [9] which have used the lag of capital buffer as a proxy for adjustment cost and found the similar results. The result for GDPG is statistically significant (p = 0.006) and its coefficient is 0.7026 which means that the GDPG has a positive impact on the level of capital buffer. In other words, a 1% increase in GDPG will lead to 0.7026 unit increase in capital buffer. Shim [22] argue that the sign of coefficient is expected to be positive for the banks which are forward-looking i.e. the banks which build up the capital at the time of economic boom. In this case the coefficient has a positive sign (0.7026) and we can infer that the Pakistani banks are forward-looking i.e. they are building up their capital in economic up turns. Crockett [8] has found that the forward-looking banks will not be in trouble in economic downturns. Our result for GDP is similar to that of Crockett [8]. Other studies like Ayuso et al., [3], Lindquist [16], Estrella [9] have also used GDP growth as a determinant of capital buffer and found the similar results.

SIZE of the bank is also significantly affecting the capital buffer having probability (p = 0.003) but with a negative sign (-0.306). This result supports the theory that small banks will have high level of capital buffer as compared to large banks. Quantitatively, we can say that a 1% increase in size of the bank will reduce the capital buffer by 0.306 units. This finding is similar to that of Acharya et al., [1] Stolz & Wedow [23] and Jokipii & Milne., [14] who found an inverse relationship between SIZE and the capital buffer.

We can see from the results that ROE is statistically significant at 1% level of confidence (p = 0.000) but a weak positive relationship since coefficient is 0.0064. ROE also shows the remuneration of the capital, a 10 unit increase in ROE will result in a 0.064 unit increase in capital buffer. This proxy has been used to capture the cost of capital i.e. the opportunity cost of capital. Contrary to the results found by (Myers & Majluf, 1984), Furfine (2001), (Fonseca & Gonzalez [11], Ayuso et al., [3] and Estrella [9] who found that ROE has a negative relationship with the level of capital buffer. They conclude that there is a tradeoff between ROE and capital buffer because they have used ROE as a proxy for cost of capital. On the other hand Jokipii& Milne [14] noted that it is possible for ROE to exceed the level of return which the shareholders are demanding and in this case it will represent a revenue measure rather than a measure of cost. In this situation the sign of the coefficient is expected to be positive. So in our case ROE is a measure of revenue rather than a measure of cost.

Share of bank's assets (SBA) is significant (p = 0.027) having the coefficient 0.026 which translate a weak positive relationship between SBA and BUFi,t. This means that larger the share of a bank's assets in total banking system assets, higher will be the level of capital buffer it holds. But due to the weakness of the relationship a 1 unit increase in the level of bank's share assets will lead to increase the buffer capital only 0.026%. This result supports the idea that larger banks should hold high level of capital buffer as compared to small banks but in real life it is not so. Usually small banks keep higher level of capital buffer. As Jokipii and Milne [14] conclude that a large bank having the largest share in the banking system will have low level of buffer and a bank with small share in the banking system may have higher level of buffer.

The result for RISK is opposite to that as was expected (p = 0.206 > 0.05) which is statistically insignificant means that RISK is not affecting the level of capital buffer . Alternatively, we can say that the Pakistani banks are not sensitive to their risk level. Contrary to the theory, Pakistani banks are not increasing their level of capital buffer with the increase in their risk level. This finding is different from Milne and Whalley [14], Ayuso et al., [3], Fonseca & Gonzalez [11] and Estrella [9] who found a positive relationship between the level of RISK and capital buffer.

The significance of Increment of loan or loan growth LOANG having probability (p = 0.014) and the coefficient (-0.0125) tells us that there is a negative relationship between BUFi,t and LOANG but a weak one. It can be inferred that banks are not increasing their level of capital buffer with the increase in their loan growth. Rather BUFi,t is decreasing as a 10% increase in loans will reduce the level of capital buffer by 0.0125 units. This result supports the result for RISK as banks are not concerned with their risk level. In other words, we can say that the banks are maintaining the minimum requirement for capital by squeezing their loans.

The AR (1) process for autocorrelation is significant having Z = -1.97 and the probability p = 0.049, which shows that there is no autocorrelation in the data, as AR (1) in Arellano-Bond test for autocorrelation has a null hypothesis of no autocorrelation. Another test for serial autocorrelation is AR (2) process in first difference which is more important than AR (1) process. This test should be insignificant and in this case, it is insignificant having probability p = 0.881. So there is no second order serial autocorrelation in the data. Test for over-identification is Hansen J test which tells us about the validity of the instruments. This test is robust version of Sargan test but this test can be weakened by the existence of high number of instruments. The p-value for this test is 0.707 which is statistically insignificant. So there is no over-identification in the model and used instruments are valid.

5. Conclusion and Recommendations

The interesting aspect of this research is that it is very much linked to the requirements by regulators (central bank) for capital adequacy ratio (CAR) and consequently it's behavior over time. The lagged dependent of capital buffer is statistically significant and shows that the model is dynamic

and there is lagged dependence in the model with reference to BUFi,t. The statistically significant result of GDPG and positive coefficient means that Pakistani banks are forward-looking i.e. the banks which build up the capital at the time of economic boom and when the next downturn will set in, they would not be in trouble.

On the other hand, the coefficient of GDP growth will have a negative sign for if the banks are short sighted meaning there by if the banks meet the required level of buffer by reducing their risk weighted assets in economic recession. This is in conformity with the Basel requirements that banks should build up their capital in good times so that when the next downturn will set in, the banks would not be in trouble. The Pakistani banks are not sensitive to their risk level i.e. they are not increasing their capital buffer with the increase in their risk weighted assets. As the insignificant result of RISK which is opposite to that as suggested by the theory. The banks should be risk sensitive i.e. they should increase their capital buffer with increase in their risk weighted assets. One reason for downward trend of capital buffers might be the gradual increase in CAR by the State Bank of Pakistan.

The SIZE of the bank is significantly affecting the level of capital buffer with a negative sign of the coefficient indicating that small banks have high level of capital buffer in terms of percentage as compared to large banks. ROE has a positive and significant relationship with capital buffer indicating that it is a measure of revenue here rather than a measure of cost of capital. Although the result of SBA is significant but a weak positive relation representing that larger the share of a bank in the banking system high level of capital buffer should it hold. The significant but negative sign of LOANG allows us to infer that banks are not increasing their level of capital buffer with the increase in loan growth. So we can say that Pakistani banks are maintaining a certain level of capital buffer by squeezing their loans.

An important finding in this research is that Pakistani banks are not sensitive to their level of risk i.e. they are not increasing their capital buffer with the increase in their loan portfolio. Keeping in view the advantages of capital buffer, banks should increase their CAR along with loan growth.

Another interesting finding is that Pakistani banks are forward-looking i.e. they are building their capital in economic up turns and hence the capital buffer. This implies that when economic downturn will set in, banks will not reduce their lending in order to maintain their capital ratio. The banks should not reduce lending in recessions as it will further aggravate the economic recession.

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