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# **Determinants of Bank Profitability and Basel Capital Regulation: Empirical Evidence from Nigeria**

**Peterson K Ozili\***

## **Abstract**

This study, empirically, investigates the determinants of bank profitability. After including the regulatory variable into the model, I find no significant difference in bank profitability during pre-and post-capital regulation regime. Second, after employing NIM and ROA profitability metrics, I find that the determinants of bank profitability, and its significance, depends on the profitability metric employed. Third, I find that asset quality is a strong determinant of bank interest margin, relative to return on asset. Also, I observe that economies of scale and scope enables larger banks to be profitable (ROA) relative to smaller banks. Overall, the insignificant effect of Basel capital regime on bank profitability seems to suggest that such regulation might not be aimed at decreasing bank profits.

January, 2015

## **Introduction**

Banking regulation continues to attract both theoretical and empirical debates. The debate intensifies as the world witnessed the unintended consequences of Basel II banking regulation which contributed to the 2008 crisis. These unintended consequences remains a rationale for the refusal or delay towards the adoption of Basel capital regulation by central bankers in some developing countries. However, banking regulators in these countries either adopt a lighter (modified)<sup>1</sup> version of Basel regulations or maintain domestic banking regulation or a combination of both. Therefore, this study has two objectives. First, I investigate the determinant of bank profitability. Second, by introducing a capital regulatory regime variable, I examine whether a lighter (or modified) version of Basel capital regulation has any significant effect on bank profit. This study contributes to the banking literature by providing an answer to the longstanding mixed conclusions on the effect of Basel capital regime or regulation on banks.

The study is organized as follows. Section 2 review of literature on the determinants of bank profitability Section 3 presents the econometric methodology. Section 4 discusses the empirical results. Finally, Section 6 concludes.

## **2. Literature Review**

### **Determinants of bank profitability**

Country-specific studies in Europe (Molyneux and Thornton, 1992), U.S (Berger, 1995; and Anghazo, 1997), Malaysia (Guru et al., 1999), UK (Kosmidou et al., 2008), China (Vong and Chan, 2006), Tunisia (Naceur, 2003), and other multi-country studies (including, Molyneux and Thornton, 1992) all show that bank-specific factors largely explains bank profitability. For example, in a cross-country study of 12 banks from Europe, Australia and North America, Bourke (1989) found a significant positive relationship between capital adequacy and profitability indicating that banks with higher capital ratio are more profitable than banks with less capital ratio. Similarly, Berger (1995) and Anghazo (1997) found that US banks with relatively high capital adequacy were more profitable than other banks with lower capital ratio. Also, Molyneux and Thornton (1992), in a study of 18 European countries for the period 1986-1989, reports a positive relationship for state-owned banks. In developing countries, Vong and

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<sup>1</sup> Modified Basel capita regulation means less stringent capital regulation. It follows the reasoning that Central bankers in developing countries will modify Basel regulation to fit the prudential needs of their bank industry.

Chan (2006) investigated the determinants of bank performance of Macao Banking industry for a 15-year period using small sample of banks and found a positive relationship. Also, bank size<sup>2</sup>, as a determinant, reports mixed conclusions. For example, Sinkey (1992) and Boyd and Runkle (1993) both reports an inverse relationship between large banks and profitability but, interestingly, Sinkey (1992) found a positive relationship for smaller banks. For developed countries, Naceur (2003) reports a negative relationship between bank size and profitability in Tunisia. Cost to income ratio measures banks` expense management. Bourke (1989) found a negative relationship between expense and profitability while a European study (Molyneux and Thornton, 1992), Malaysian study (Guru et al, 1999) and a Tunisian study (Naceur, 2003) documents a positive relationship between expenses and profitability.<sup>3</sup> Therefore, conclusions on the relationship of this variable is mixed. Also, prior research reports mixed relationship for external determinants of bank profitability. For example, Guru et al (1999) in a study of Malaysian banks and Jiang *et al.* (2003) in a study of banks in Hong Kong, both, report a positive relationship between inflation and bank profitability while Abreu and Mendes (2000), in a study of European banks, reports a negative relationship. Similarly, Demircuc-Kunt and Huizinga (1999) in a study of banks in developing countries, found a negative relationship. However, inflation cannot be a sole determinant of bank profitability when examined in isolation.

### **Capital Regulation and Bank Profitability**

The theoretical literature predicts that capital regulation should have a negative impact on bank profit. For example, Santos (2000) argues that bank regulation through higher capital requirements negatively affects bank development and credit expansion by increasing fixed costs and operating costs, though, net interest income may increase also. Calem and Bob (1999) suggests that increased capital regulation can force under-capitalized banks to engage in risk-taking behaviour that can have unintended negative consequences on banks. Also, Claessens and

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<sup>2</sup>Vong and Chan (2006) argued that though banks have size-related economies and diseconomies of scale, however, bank size alone does not guarantee high profitability. Therefore, conclusions on this variable should be interpreted with caution.

<sup>3</sup>Vong and Chan (2006) suggests that a positive relationship for this determinant might be explained by the fact that banks are able to pass their overheads to depositors and borrowers in terms of lower deposit rates or by transferring the bank's tax burden to customers who are faced with an inelastic demand for banking services, thereby, transferring a large portion of cost to bank customers.

Klingebiel (2000) argue for less bank regulation and suggest that fewer regulatory restrictions permits banks to efficiently utilize economies of scale and scope. Jackson et al (1999) in a review of prior studies, concludes that banks might maintain high capital levels even if they were not regulated and that there is no conclusive evidence to show that banks would not maintain high capital requirement if they were unregulated without Basel capital regulations.

In contrast, other empirical studies reports mixed conclusions (e.g. Barth et al, 2004; Chiuri et al., 2002; and Pasiouras et al., 2008). Barth et al (2004) examined the relationship between regulatory and supervisory practices and banking-sector development in 107 countries and found that direct regulation and supervision of banks activities by the government significantly hinders bank performance. Also, in a study of 572 banks in 15 developing countries after controlling for banking crises, Chiuri et al (2002) show evidence that enforcing capital regulation led to a reduction in bank loan supply which is a major source of bank interest income.<sup>4</sup> In a study of 615 publicly quoted commercial banks over a 4-year period, Pasiouras et al (2008) found that bank regulation, in the form of bank restriction and capital regulation, had a negative impact on profit efficiency but a positive impact on cost efficiency. Overall, there seem to be mixed conclusions on some determinants of bank profitability as well as the effect of regulation on bank profitability.

### **3. Data, Hypothesis and Econometric Methodology**

#### **3.1 Dataset**

Data is obtained from bank financial statements. Macroeconomic data for GDP and inflation were obtained from Central bank's statistical bulletin and monetary policy review publications available on its website. A sample of 6 banks out of 24 banks are examined for 8-year period 2006 to 2013. This yields 48 bank-year observations. The sample period, 2006-2013, was chosen partly for data availability and to incorporate major regulatory changes within the banking industry of the country under investigation, Nigeria. Also, banks had to meet the following conditions to be included in the sample. First, sample banks must be operating within the Nigerian banking sector and should have its stocks listed on the Nigerian stock exchange. Second, sample banks must be classified as commercial banks, thus, merchant banks, foreign

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<sup>4</sup> A reduction in loan supply affects banks' net interest margin.

banks, non-public banks, state banks, investment banks were excluded. Third, sample banks must have available data obtained from the annual balance sheet and income statement accessible on their website. Finally, sample bank must have being in existence from 2006 to 2013, therefore, it excludes new banks that were non-existent as at 2006. Overall, sample banks that met these conditions accounted for 45 per cent of total assets of the banking industry and 47 per cent of total deposits of the industry. A justification for the sample choice is the fact that the sample banks used for this analysis are among the 8 banks declared by the Central bank to be systemically important in the country as at September, 2013.<sup>5</sup>

### 3.2 Methodology

I employ panel data regression to investigate the determinants of bank profitability.

$$\text{Model 1: } Y_{it} = \alpha + \beta \text{INT}_{it} + \gamma \text{EXT}_{it} + \epsilon_{it}$$

$$\text{Model 2: } Y_{it} = \alpha + \beta \text{INT}_{it} + \gamma \text{EXT}_{it} + \eta \text{REG}_t + \epsilon_{it}$$

Where,  $i$ , represents bank and  $t$  represents the year.  $Y_{it}$  is the dependent variable represented by  $\text{NIM}_{it}$ , and  $\text{ROA}_{it}$ .  $\text{INT}_{it}$  represents bank-specific factors which include  $\text{CAR}_{it}$ ,  $\text{CL}_{it}$ ,  $\text{BSIZE}_{it}$  and  $\text{AQ}_{it}$ , while  $\text{EXT}_{it}$  represents external determinants which include  $\text{GDPR}_{it}$ , and  $\text{INFR}_{it}$  (see. table 5 variable description). The main parameter of interest in model 2 is ‘ $\eta$ ’ which captures whether capital regulation regime had an effect on bank profitability. It is assumed that the disturbance term  $\epsilon_{it}$  is a normally distributed.

### 3.3 Variable Description

Similar to other studies, I employ three measures of bank profitability. The choice of ratios is consistent with prior studies (e.g. Guru et al, 1999). The dependent variables are return on asset and net interest margin. Return on assets is measured as profit after tax scaled by total assets. Return on equity is measured as profit after tax scaled by total equity. Net interest margin is measured as net interest income (interest income less interest expense) scaled by earnings assets (total asset less fixed asset and goodwill). Net interest margin measures the return on the bank’s interest-earning assets. Independent variables includes five bank-specific variables and three

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<sup>5</sup> The sample banks include: First, Zenith, UBA, GTB, Diamond, Skye, Access. More information about the systemically important Nigerian banks refer to Thisdaylive (2013, November, 12) <http://www.thisdaylive.com/articles/cbn-designates-eight-banks-too-big-to-fail-/164074/>

external determinants. Capital adequacy ratio (CAR) measures the ability of bank capital to mitigate the risk of insolvency. It is expected that the higher this ratio, the lower the need for external funding and, therefore, the higher the profitability of the bank. I hypothesize a positive relationship between capital adequacy ratio and bank profitability. Cost to income ratio measures management's ability to control operating cost. It is expected that higher expenses is associated with lower profitability, therefore, I hypothesize a negative relationship between bank's cost-income ratio and profitability and vice versa. Asset quality (AQ) measures how much provision banks set aside against loan losses on its loan portfolio. In theory, a positive relationship between asset quality and profitability is expected. Similarly, theory predicts a positive relationship between bank size and bank profit. Also, in theory, a positive relationship between bank profitability and the inflation variable is expected because high inflation rates are associated with high loan interest rates and, thus, high interest income. In theory, growth in real GDP rate in periods of low risk of default on bank loans leads to increased demand for bank services, therefore, improving bank profitability, thus, a positive relationship is expected. However, in periods with high risk of default on loans, a negative relationship might be expected. Regulation is expected to affect bank performance but it is difficult to predict this sign. The regulatory dummy variable equals one in the post capital regulation regime and zero, otherwise. A significant positive sign on this variable indicates that capital regime improves bank profitability while a significant negative sign suggests that the capital regimes negatively affect bank profitability.

## **4. Discussion of Empirical Results**

### **4.1 Descriptive statistics and correlations**

Table 1 presents the descriptive statistics for the full sample. The mean and median value of ROA, NIM, CAR appears to be normally distributed while CI, AQ, INFR, GDPR appears to be less normally distributed. Table 4 shows the Pearson correlation coefficients of the sample variables. Table 4 show that NIM is significantly correlated with AQ and GDPR and is consistent with apriori expectations, relative to ROA. REG coefficient is not significant but is negative for NIM and positive for ROA. This might suggest that capital regulation was intended to decrease risk-taking associated with bank interest activities. However, the insignificant sign on both measures of profitability do not support this inference. ROA reports a significant positive

relationship with BSIZE which suggests that economics of scope in banks make them more profitable. GDPR and CI coefficients show a significant negative sign with ROA.

	ROA	NIM	CAR	CI	AQ	BSIZE	GDPR	INFR
Mean	0.019	0.055	0.153	16.22	0.015	20.61	6.62	10.8
Median	0.018	0.052	0.154	1.956	0.007	20.71	6.34	11.1
Maximum	0.053	0.101	0.267	629.2	0.069	21.8	7.9	15.1
Minimum	-0.005	0.026	0.056	-3.101	0.0001	18.9	6	6.6
Std. Dev.	0.012	0.017	0.0451	90.47	0.017	0.676	0.692	2.76
Observations	48	48	48	48	48	48	48	48

#### 4.1 Results and theoretical consistency

First, I observe the sign on the coefficients in Table 2 to identify consistency with theoretical expectations. The signs on CAR, CI and AQ, is consistent with apriori theoretical expectations while GDPR and INFR show conflicting signs.

Model 1		(i)			(ii)		
		NIM			ROA		
Variable	Exp.	coefficient	t-stat	p-value	coefficient	t-stat	p-value
CAR	+	0.111*	1.99	0.0526	0.106**	2.57	0.0137
CI	-	-0.00004	-1.62	0.1137	-0.00004**	-2.55	0.0146
AQ	+	0.665***	4.52	0.000	-0.024	-0.22	0.8278
BSIZE	+	0.003**	2.52	0.0158	0.003***	3.42	0.0014
GDPR	+	-0.0033	-0.89	0.3743	-0.007***	-2.76	0.0086
INFR	+	-0.0009	-1.06	0.2934	-0.001	-1.09	0.2781
Adjusted R <sup>2</sup>		36.13			27.37		
Observation		48			48		
Model 1(i)		NIM = $\alpha$ + CAR + CI+ AQ+ BSIZE+ GDPR+INFR + $\epsilon_{it}$					
Model 1(ii)		ROA = $\alpha$ + CAR + CI+ AQ+ BSIZE+ GDPR+INFR + $\epsilon_{it}$					
Note: T-statistics is significant at *10%, **5% and ***1% significance levels							



### 4.3 Determinants of Bank Profitability and Regulation

In table 3(i), capital adequacy ratio (CAR) and loan quality (AQ) are significantly related to bank interest margin (NIM) at 10% and 1% level of significance. The significant positive coefficient of the CAR variable is consistent with the findings of Bourke (1989), Berger (1995), Vong and Chan (2006) and Anghazo (1997). The sign on AQ indicates sound credit risk management among Nigerian banks. Also, ROA is significantly related with CAR, CI, BSIZE and GDPR. The significant positive sign on BSIZE suggest that large banks are profitable relative to small banks. The significant positive sign on CAR indicates that capital regulation has a positive effect on bank profitability. Overall, capital regulation regime variable (REG) had no significant effect on bank profitability (NIM and ROA).

Table 3: Regression Statistics (Regulatory Dummy Inclusive)							
Model 2:		(i)			(ii)		
		NIM			ROA		
Variable	Exp	Coefficient	t-stat	P-value	Coefficient	t-stat	P-value
CAR	+	0.114*	2.01	0.0516	0.107**	2.56	0.0143
CI	-	-0.00004	-1.59	0.1199	-0.00004**	-2.51	0.0161
AQ	+	0.649***	4.27	0.0001	-0.031	-0.28	0.7824
BSIZE	+	0.002	1.09	0.2819	0.003*	1.75	0.0875
GDPR	+	-0.002	-0.52	0.6083	-0.007**	-2.18	0.0352
INFR	+	-0.0004	-0.24	0.8142	-0.0005	-0.39	0.6978
REG	?	0.004	0.48	0.6342	0.002	0.31	0.7569
Adjusted R <sup>2</sup>		34.94			25.77		
Observations		48			48		
Model 2 (i): $NIM = \alpha + CAR + CI + AQ + BSIZE + REG + GDPR + INFR + \epsilon_{it}$							
Model 2 (ii): $ROA = \alpha + CAR + CI + AQ + BSIZE + REG + GDPR + INFR + \epsilon_{it}$							
Note: t-statistics are significant at *10%, **5%, ***1%. Significance levels							

## 5. Conclusion

My findings do not provide evidence to support theoretical expectations that Basel capital regulatory regime negatively affects bank profitability. Also, based on my findings, I conclude that the determinants of bank profitability depends on the measure of profitability employed.

## Bibliography

Angbazo, L. (1997) “Commercial Bank Interest Margins, Default Risk, Interest-rate Risk, and Off-balance Sheet Banking”, *Journal of Banking and Finance*, Vol. 21, No. 1, pp. 55-87.

Barth, J.R., Caprio, G. and Levine R. (2004) “Bank regulation and supervision: what works best?”, *Journal of Financial Intermediation*, Vol.13, No. 2, pp. 205-248.

Berger, A. (1995) “The Relationship between Capital and Earnings in Banking”, *Journal of Money, Credit and Banking*, Vol. 27, No. 2, pp. 432-456.

Bourke, P. (1989), “Concentration and Other Determinants of Bank Profitability in Europe, North America and Australia”, *Journal of Banking and Finance*, Vol. 13, No.1, pp. 65-79.

Boyd, J.H., Chang, C. and Smith, B.D. (1998) “Moral hazard under commercial and universal banking”, *Journal of Money, Credit, Banking*, Vol. 30, No.3, pp. 426-468.

Calem, P., Rob, R. (1999) “The Impact of Capital-Based Regulation on Bank Risk-Taking”, *Journal of Financial Intermediation*, Vol. 8, No.4, pp. 317-352.

Claessens, S. and Klingebiel, D. (2000) “Competition and scope of activities in financial services”, Mimeo. World Bank, Washington D.C., April.

Chiuri, M. C, Feeri, G. and Majnoni, G. (2002) “The macroeconomic impact of bank capital requirements in emerging economies: past evidence to assess the future”, *Journal of Banking and Finance*, Vol. 26, No.5, pp. 881-904.

Demirguc-Kunt, A., Huizinga, H., 1998. Determinants of commercial bank interest margins and profitability: some international evidence. *World Bank Economic Review* 13, 379-408.

Guru, B.K., Staunton, J and Balashanmugam, B. (1999) “Determinants of Commercial Bank Profitability in Malaysia”, Paper presented at the 12th Annual Australian Finance and Banking Conference, Sydney, Australia, 16-17 December. Available at:

<http://web.usm.my/aamj/5.2.2000/5-2-1.pdf>.

Jackson, P., and Furfine, C., Groeneveld, H., Hancock, D., David Jones, D., Perraudin, W., Radecki, L., Yoneyama, M. (1999) “Capital Requirements and Bank Behaviour: The Impact of the Basle Accord”, Basle Committee on Banking Supervision Working Papers, No. 1, April.

Jiang, G., Tang, N., Law, E., and Sze, A. (2003), “Determinants of Bank Profitability in Hong Kong”, Hong Kong Monetary Authority Research Memorandum, September. Available at:

<http://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb200309/fa1.pdf>

Kosmidou, K., Tanna, S. and Pasiouras, F. (2008) “Determinants of profitability of domestic UK commercial banks: panel evidence from the period 1995–2002”, Coventry University Working Paper.

Molyneux, P. and Thornton, P. (1992), “Determinants of European Bank Profitability: A Note,” *Journal of Banking and Finance*, Vol. 16, No. 6, pp. 1173-1178.

Naceur, S. B. (2003) “The Determinants of the Tunisian Banking Industry Profitability: Panel Evidence”, *UniversiteLibre de Tunis Working Papers*. Available at:

<http://www.mafhoum.com/press6/174E11.pdf>

Santos, J. A. C. (2000) “Bank capital regulation in contemporary banking theory: a review of literature”, *BIS working Papers*, No 90, pp. 1-32.

Sinkey, J. Jr. (1992) “Commercial Bank Financial Management in the Financial Services Industry”, New York., Macmillan Publishing Company.

Pasiouras, F., Tanna, S., and Zopounidis, C. (2008) “Banking regulations, cost and profit efficiency: Cross-country evidence” Available at: <http://ssrn.com/abstract=1103436>

Vong, P.I., and Chan H. S. (2006) “Determinants of Bank Profitability in Macao”, The 30th Anniversary of Journal of Banking and Finance Conference, Beijing.

Table: Correlation Matrix

Correlation Probability	ROA	NIM	CAR	CI	AQ	BSIZE	REG	GDPR
NIM	0.294** 0.042							
CAR	0.080 0.587	0.221 0.131						
CI	-0.285* 0.050	-0.014 0.923	0.369*** 0.009					
AQ	-0.346** 0.016	0.571*** 0.0000	0.128 0.385	0.183 0.213				
BSIZE	0.262* 0.072	0.159 0.280	0.011 0.942	-0.075 0.610	-0.135 0.362			
REG	0.197 0.179	-0.149 0.311	-0.525*** 0.0001	-0.199 0.174	-0.346** 0.016	-0.004 0.978		
GDPR	-0.323** 0.025	0.343** 0.017	0.317** 0.028	0.095 0.519	0.509*** 0.0002	0.1123 0.447	-0.389 0.006	
INFR	-0.044 0.766	0.191 0.195	0.457*** 0.001	0.170 0.248	0.3012** 0.038	0.227 0.122	-0.78 0.0000	0.111 0.453

Table 5: Summary of Variables			
Variables	Symbol	Description	Formulae
Return on Assets	ROA	Bank operating profitability	After-tax profit / Total asset
Net Interest Margin	NIM	Interest returns from loans	(Interest income minus interest expense) / Earnings asset
Capital Adequacy Ratio	CAR	Measures banks liquidity against insolvency	Equity capital / Total asset
Cost-to-Income ratio	CI	Measures efficiency in expense management	Operating expense / Pre-tax profit
Asset Quality	AQ	Measures loan quality	Loan Loss provision / Total Liability
Bank Size	BSIZE	Bank size is measured by total asset.	Natural Logarithm of total assets
Regulation Variable	REG	CBN annual statistics	Dummy Variable. REG takes the value '1' for post-Basel capital regime and '0' less strict regulation is assigned '0'. For REG' variable, activity restriction is assigned '0' capital regulation '1'
Inflation rate	INFR	CBN annual statistics	Obtained as given by Central Bank of Nigeria
GDP growth rate	GDPR	CBN annual statistics	Obtained as given by Central Bank of Nigeria