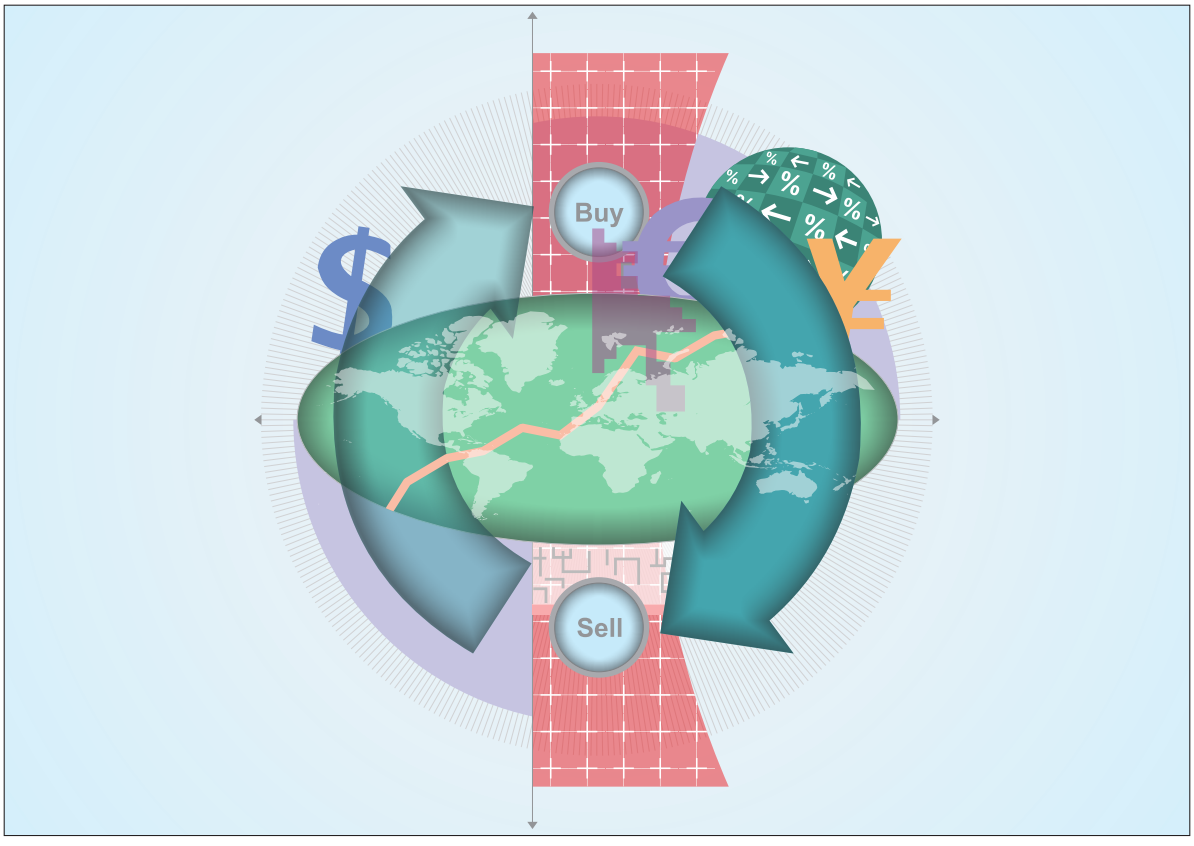

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Capital Adequacy, Cost Income Ratio and the Performance of Commercial Banks: The Kenyan Scenario

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Abstract: This study provides evidence that supports the Central Bank of Kenya's move to gradually raise bank capital levels by 2012 and to tightly monitor the operations of banks so as to ensure that Kenyan banks are more efficient in their operations while at the same time being profitable. With the present global credit crunch, capital adequacy and the cost-income ratio being critical for banks, the present study examines the relationship between these variables and profitability. Using the return on assets and the return on equity as proxies for bank profitability for the period 1998 to 2007, the study finds that bank profitability is positively related to the core capital ratio and the tier 1 risk-based capital ratio. This implies that an increase in capital may raise expected earnings by reducing the expected costs of financial distress, including bankruptcy. The study also establishes that there exists negative relationship between the equity capital ratio and profitability. The study also finds out that Kenyan banks are not competitive enough globally in terms of their efficiency as measured by the Cost-Income Ratio (CIR). The study reveals that the CIR is inversely related to both bank profitability measures. The study also reveals that the CIRs of Kenyan banks are higher than those of developed countries. This means that Kenyan banks should strive to keep their CIR to a minimum level, if possible below the 50% threshold for them to be more efficient so as to be globally competitive.

Key words: Global financial crisis, financial institutions, bankruptcy, capital adequacy, cost income ratio

INTRODUCTION

In an effort to promote efficiency in the banking industry and after a period of worldwide liberalization and deregulation, the Basel Capital Accord of 1988 (Basel I) which led to the endorsement of a new capital adequacy framework (Basel II) in 2004 (operational from 2007) marked the beginning of a new phase of re-regulation with an attempt to bring about an international harmonization of banking regulations (Bichsel and Blum, 2005). Kenyan banks are by and large yet to adopt model based approaches to assessing their capital adequacy needs (Central Bank of Kenya, 2008a). In assessing bank's efficiency, the level, nature and composition of capital and the cost income ratio are some of the key measures used (Bourke, 1989; Berger, 1995; Thompson *et al.*, 2002; Navapan and Tripe, 2003; Hess and Francis, 2004; Welch, 2006; Giokas, 2007). Kwan and Eisenbeis (1995) and Hughes and Moon (1995) argued that it is necessary to recognize explicitly the concept of efficiency in the empirical models linking bank capital to risk and to distinguish between efficient and inefficient risk undertaking.

Capital adequacy has been the focus of many studies and regulator as it is considered to be one of the main drivers of any financial institution's profitability (Bourke, 1989; Berger, 1995; Thompson *et al*.., 2002; Navapan and Tripe, 2003; White and Morrison, 2001). In contrast, other studies argue that in a world of perfect financial markets, capital structure and hence capital regulation is irrelevant (Modigliani and Miller, 1958). However, White and Morrison (2001) posited that the regulator ensures that banks have enough of their own capital at stake. Bichsel and Blum (2005) supported this proposition arguing that these regulations help in reducing negative externalities (e.g., disruptions to the payments system and a general loss of confidence in the banking system) in addition to boosting the slow economic growth hence the Gross Domestic Product (GDP). These propositions leads to the question: what then do prudential capital requirements accomplish in the banking sector? This study suggests that these requirements have something to do with a bank's performance. In Kenya, the government, through the Central Bank of Kenya has put requirements that all commercial banks should gradually increase their capital base to one billion Kenya shillings from the current 250 million Kenya shillings by 2012 (currently, 1US$ = 77.20 Kenya shillings) (Central Bank of Kenya, 2008b). This represents a 300% increase. This means that the level of capital has some implication on the performance and bankruptcy of a bank, a subject which is being investigated by this study.

The Cost Income Ratio (CIR), with its limitations (Welch, 2006), is another emerging measure of bank's efficiency and a benchmarking metric (Tripe, 1998; Hess and Francis, 2004). Being a standard benchmark of bank's efficiency, the CIR measures a bank's operating costs as a proportion of its total (i.e., net interest and non-interest) income (Welch, 2006). This study also seeks to establish whether the CIR affects bank's profitability.

In measuring the profitability of a bank, bank regulators and analysts have used Return On Assets (ROA) and return on equity (ROE) to assess industry performance and forecast trends in market structure as inputs in statistical models to predict bank failures and mergers and for a variety of other purposes where a measure of profitability is desired (Gilbert and Wheelock, 2007; Mostafa, 2007; Christian *et al*., 2008).

Navapan and Tripe (2003) explained that comparing banks' Returns On Equity (ROE) is one way of measuring their performance relative to each other. The return on equity looks at the return on the shareholder's investment and thus from the shareholder's perspective, allows a comparison of investment in a bank's shares with other investment opportunities, while it can also provide a measure of the bank's riskiness (Gilbert and Wheelock, 2007).

Cotter (1966) noted that where shareholder interests are controlling, capital is an important managerial decision variable and the capital position of the wealth-maximizing bank theoretically will affect its capital structure and the loan policy. To the extent that capital does affect lending, it has implications for the performance of banks as financial intermediaries and hence for the allocation of real resources within the economy. Cotter (1966) concluded by pointing out that from this standpoint, market determined capital positions seem preferable.

Capital (equity and long-term debt) represents a source of funds to the bank along with deposits and borrowings. Pringle (1971) observed that an undercapitalized bank will find itself subjected to high levels of short-term borrowing at potentially high excess costs during periods of tight money. Flamini *et al*. (2009) postulated that bank returns are affected by macroeconomic variables, suggesting that macroeconomic policies that promote low inflation and stable output growth does boost credit expansion.

According to Christian *et al.* (2008), capital adequacy measures provide significant information regarding a firm's returns, while a few of the individual variables representing asset quality and earnings are informative. Size and growth and loan exposure measures do not appear to have any significant explanatory power when examining returns. The study establishes that the change in total assets is also significant. Thus the present study has included these variables in its model to examine the relationship between capital adequacy, cost income ratio and profitability.

Navapan and Tripe (2003) asserted that the proposition that there should be a negative relationship between a bank's ratio of capital to assets and its return on equity may seem to be self-evident as to not need empirical verification. It is therefore important to note that Berger (1995) found evidence for a positive relationship that is, the ratios of capital to assets and returns on equity were positively related. He argued that a higher capital ratio (with reduced risk of bankruptcy) should reduce a bank's cost of funds, both by reducing the price of funds and the quantity of funds required, thus improving a bank's net interest income and hence profitability.

However, Navapan and Tripe (2003) found the contrary - that is, negative relationship between capital and profitability exists. Ghosh *et al.* (2003) explained that banks are required to hold capital equal to a certain percentage of the total risk-weighted assets. Under the risk-based standards, capital consists of two parts: tier-I capital (comprising equity capital and published reserves from post-tax retained earnings) and tier-II capital (comprising perpetual preferred stock, loan loss reserves, sub-ordinated debt, etc.). Using the expected bankruptcy theory, Lewis (2008) explained that the expected bankruptcy costs hypothesis can be used to explain part of the observed positive relationship between capital asset ratios (CARs) and return on assets (ROA) under certain circumstances. This reasoning forms the basis for the first set of testable hypotheses as follows:

H_1: Capital adequacy is positively related to bank profitability. This leads to individual tests of the following sub-hypotheses:

H_{1A}: The core capital (leverage) ratio is positively related to bank profitability
H_{1B}: The equity capital to assets ratio is positively related to bank profitability
H_{1C}: Tier 1 risk-based capital ratio is positively related to bank profitability
H_{1D}: The ratio of total capital to assets is positively related to bank profitability

The other factor affecting bank's profitability is its efficiency as measured by the cost-income ratio. The cost income ratio, defined by operating expenses divided by operating income, can be used for benchmarking by the bank when reviewing its operational efficiency. Hess and Francis (2004) observed that there is an inverse relationship between the cost income ratio and the bank's profitability. Ghosh *et al.* (2003) also found that the expected negative relation between efficiency and the cost-income ratio seems to exist.

The study shows that the cost-income ratio is negative and strongly significant in all estimated equations, indicating that more efficient banks generate higher profits. This analysis means that the cost income ratio also affects the profitability of the bank. It is from this reasoning that this study develops the second hypothesis:

H_2: Cost-income ratio is negatively related to bank profitability

This study focuses on the relationship between two determinants (i.e., capital adequacy and cost-income ratio) and the profitability of commercial banks in Kenya with a view to drawing conclusions as to what extent they do account for the performance of banks in Kenya. The purpose of this research is to examine closely the capital-earnings relationship so as to determine which among the potential explanations of the relationship appear to be important.

This study, examine the direction with which efficiency measures (as measured by capital adequacy ratios (CARs) and the CIR)) affect bank's profitability (as measured by ROA and ROE) so as to provide some insight as to why bank regulation and efficiency should be upheld. Previous research shows that a positive relation exists between capital adequacy and profitability (Berger *et al*., 1995; Ghosh *et al*., 2003) while a negative relationship exists between cost income ratio and profitability (Francis, 2004; Ghosh *et al*., 2003).

MATERIALS AND METHODS

The data used in this study was acquired from the Kenyan Capital Market's Authority Library, the Kenyan Banking Survey (Think Business, 2009), internet and web sites of the licensed commercial banks operating in Kenya. Data was obtained from the annual financial statements for a selected sample of 41 out of the 44 licenced commercial banks in Kenya (Centrel Bank of Kenya, 2008a) for a period of ten years (1998 to 2007). This represents 93% of all registered commercial banks in Kenya. The three banks omitted from the sample had missing financial data for most years. This is because they were established in later years hence omitted from the sample.

The collected data was analyzed and interpreted with the help of different financial ratios and statistical tools including percentages, averages, trend analysis, regression, correlation and the significance test using Minitab Software. The five hypotheses were tested statistically to arrive at the conclusions and policy implications. The approached used in this studies is used by Lazaridis and Tryfonidis (2006) to analyze the different variables.

Using Gilbert and Wheelock's (2007) approach, I measured profitability using the two ratios, ROA and ROE. The sources and formulae of the variables used in this study are summarized in Table 1.

Table 1: Variable definitions

Variable	Formula	Source
Return on assets (ROA)	Net income after taxes and extraordinary items/total assets	Athanasoglou and Delis (2006), Gilbert and Wheelock (2007), Hughes and Moon (1995)
Return on equity (ROE)	Net income/total equity	Gilbert and Wheelock (2007), Navapan and Tripe (2003)
Core capital/assets (CCA)	Tier 1 (core) capital/total assets	Hutchison and Cox (2006)
Equity capital/assets (ECA)	Total equity capital/total assets	Hutchison and Cox (2006)
Core capital/risk weighted assets (TRC)	Tier 1 (core) capital/risk-weighted assets	Hutchison and Cox (2006)
Total capital/assets (TCA)	Total risk-based capital/risk-weighted assets	Christian *et al.* (2008), Hutchison and Cox (2006)
Cost income ratio (CIR)	Operating expenses/operating income	Christian *et al.* (2008)
Bank size (BS)	Natural logarithm of total assets	Christian *et al.* (2008)
Asset growth (AG)	(This year's total assets-previous year's total assets)/previous year's total assets	Christian *et al.* (2008), Hua (2006)
Assets/liabilities (AL)	Assets/liabilities	Hua (2006)
Debt to equity (DE)	Total debt/ total equity	Ghosh *et al.* (2003)
Auditor (Aud)	1 for the big four, 0 otherwise	Christian *et al.* (2008)

RESULTS AND DISCUSSION

Table 2 shows the summary statistics of the collected variables. The total observations are n = 410 with the exception of the debt to equity ratio with 407 observations. The banks included in the sample had an average (median) of 1.75 (1.92) per cent return on assets and a higher mean (median) of 9.71 (10.57) percent return on equity. The core capital to assets ratio averaged 16.87% (median = 10.62%). On average, the equity capital to assets ratio was 17.54% (median = 14.73%). The average (median) core capital to risk weighted assets averages 25.59 (20.66%)while the total capital to total assets ratio was 16.82 (10.81%). All the CARs indicate that Kenyan banks operate above the minimum statutory levels. A typical bank in the sample had a cost income ratio of 67.66% (median = 62.49%). This ratio implies that Kenyan banks are keen on managing their efficiency levels in relation to cost-cutting innovations. On average, the typical bank had the size of 8.66 (as measured by the natural logarithm of total assets). The mean (median) asset growth was 20.38 (9.75%). The total assets to total liabilities averaged 126.66% (median = 117.25). On average, a typical bank in the sample had a 17.30% debt to equity ratio (median = 7.62%). These descriptive statistics imply that most banks are keen on ensuring that their capital levels are above the minimum required statutory limits.

This Table reports summary statistics for the full sample of 410 firm-year observations for the periods 1998-2007. Except for debt to equity ratio with 407 firm years, all the other variables share a common sample size of 410 firm years.

In Table 3, we have the Pearson correlation Table for the variables that were included in the regression models. The results indicate that the Return On Assets (ROA) is negatively correlated with the CIR, the debt to equity ratio (DE) and the auditor dummy (Aud). The results also indicate that the Return On Equity (ROE) is negatively correlated with the core capital ratio, the risk weighted capital ratio, the total capital ratio, the CIR, the total assets to liabilities ratio, the debt to equity ratio and the auditor dummy.

The consistency of the two profitability negative correlation with CIR is consistent with the view that the higher the CIR, the lower the profitability. Most banks strive to minimize the CIR as much as possible. The other CARs are positively correlated with the two profitability measures, demonstrating a consistent view that there exists a positive relationship between capital adequacy and profitability. The higher the capital levels, the higher the profitability (Bourke, 1989; Berger, 1995). These findings are in support of the current proposed directive by the Central Bank of Kenya (2008) that the bank capital levels need to be raised from 250 million Kenya shillings to 1 billion Kenya shillings.

Table 2: Summary statistics

	No. of firm					
Variables	Year observations	Mean	25 (%)	Median	75 (%)	SD
Return on assets (%)	410	1.75	0.97	1.92	3.34	3.61
Return on equity (%)	410	9.71	5.58	10.57	22.55	58.74
Core capital/assets (%)	410	16.87	10.15	10.62	19.31	12.10
Equity capital/assets (%)	410	17.54	11.27	14.73	19.55	10.64
Core capital/risk weighted assets (%)	410	25.59	15.58	20.66	30.93	15.11
Total capital/assets (%)	410	16.82	10.44	10.81	18.83	11.12
Cost income ratio (%)	410	67.66	53.70	62.49	74.92	28.34
Bank size (ln Assets)	410	8.66	7.88	8.35	9.35	1.21
Asset growth (%)	410	20.38	-0.38	9.75	22.18	113.12
Assets/liabilities (%)	410	126.66	112.80	117.25	124.92	36.41
Debt to equity (%)	407	17.30	2.68	7.62	20.12	32.02
Big 4 auditors (1/0)	410	0.95	1.00	1.00	1.00	0.22

Source: 1998-2007 survey data, author's computation

Table 3: Pearson Table for the variable correlations

Veriables	ROA	ROE	CCA	ECA	TRC	TCA	CIR	BS	AG	AL	DE
ROE	0.495										
	(0.000)***										
CCA	0.124	-0.224									
	(0.016)**	(0.000)***									
ECA	0.159	0.005	0.566								
	(0.002)***	(0.927)	(0.000)***								
TRC	0.010	-0.160	0.725	0.720							
	(0.890)	(0.026)**	(0.000)***	(0.000)***							
TCA	0.043	-0.311	0.914	0.466	0.703						
	(0.401)	(0.996)	(0.000)***	(0.000)***	(0.000)***						
CIR	-0.606	-0.425	0.087	0.077	-0.057	0.067					
	(0.000)***	(0.000)***	(0.078)*	(0.136)*	(0.430)	(0.176)					
BS	0.115	0.074	-0.219	-0.336)	-0.484	-0.179	-0.034				
	(0.025)**	(0.136)*	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.491)				
AG	0.094	0.051	-0.052	-0.035	0.140	-0.045	-0.035	0.186			
	(0.068)*	(0.304)	(0.291)	(0.494)	(0.050)**	(0.365)	(0.477)	(0.000)***			
AL	0.125	-0.009	0.560	0.902	0.719	0.512	0.113	-0.110	-0.032		
	(0.015)**	(0.849)	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.022)**	(0.026)**	(0.512)		
DE	-0.038	-0.097	-0.630	-0.035	-0.129	-0.545	0.009	0.044	0.080	-0.015	
	(0.463)	(0.050)**	(0.000)***	(0.496)	(0.072)*	(0.000)***	(0.863)	(0.375)	(0.107)*	(0.764)	
AUD	-0.196	-0.101	0.050	0.025	0.032	0.038	0.151	-0.251	-0.128	0.031	-0.020
	(0.000)***	(0.041)**	(0.313)	(0.625)	(0.659)	(0.443)	(0.002)***	(0.000)***	(0.009)***	(0.524)	(0.683)

The p-values are in parentheses with * , ** and * denoting significance at the 10, 5 and 1% levels, respectively**

In order to adhere to this directive which becomes effective in 2012, most banks will be forced to merge or even seek additional capital. Some banks will be forced to seek additional capital by being listed on the Nairobi Stock Exchange (NSE), an action this study seems not to advise banks to do. Other banks will consider floating corporate bond inorder to raise their capital levels.

Table 3 shows the Pearson product moment coefficient of correlation (also called the correlation coefficient or correlation) for pairs of variables. The correlation coefficient is a measure of the degree of linear relationship between two or more variables. The dependent variables for the study are bank profitability as measured by the Return On Assets (ROA) (defined as net income after taxes and extraordinary items as a percentage of total assets) and the Return On Equity (ROE) (defined by net income scaled by total equity) (Gilbert and Wheelock, 2007). The independent variable are: the core capital (leverage) (CCR) ratio (given by tier 1 (core) capital to total assets), the equity capital to assets ratio (ECA) (given by total equity capital scaled by total assets), tier 1 risk-based capital ratio (TRC) (given by tier 1 (core) capital to risk-weighted assets), the ratio of total risk-based capital to assets (TCA) (defined as the ratio of total risk-based capital to risk-weighted assets), the cost-income ratio (CIR)(expressed as operating expenses scaled by operating income), bank size (given by the natural logarithm of total assets of the bank) and the asset growth(AG) (arrived at as follows ([this year's total assets-previous year's total assets]/previous year's total assets)). Consistent with Bichsel and Blum (2004), the debt to equity ratio will be used as a control for the bank's leverage and the ratio of total assets to total liabilities will also be used as a control variable. The auditor (Aud) for a particular company is shown as a dummy variable given as 1 for the big 4 and 0 for any other auditor. Other controls (although not indicated) include firm year controls (D_t).

Inorder to assess the relationship between profitability and capital adequacy ratios, the profitability is modeled as a function of the core capital ratio, the equity capital ratio, the total risk based capital and the total capital ratio. Consistent with Gilbert and Wheelock (2007), I use ROA and ROE as the proxies for bank profitability. Table 1 shows that the mean ROA and ROE in the sample is 1.75 and 9.71, respectively. These means are close to the median ROA and ROE of 1.92 and 10.57, respectively. This means that there is minimal skewness in the results and hence, no need to adjust for skewness. Panels A and B show the regression results in five different models.

Table 4: Regression estimates of the various capital adequacy determinants and cost to income ratio for the banks under study. The dependent variable is return on assets

	Dependent variable = Return on assets (ROA)				
Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-7.214(0.063)*	-12.578(0.017)**	-6.881(0.122)*	-5.287(0.166)	-4.897(0.076)*
Core capital/assets	0.110(0.144)*	-	-	-	-
Equity capital/assets	-	-0.100(0.409)	-	-	-
Core capital/risk weighted assets	-	-	0.071(0.024)**	-	-
Total capital/assets	-	-		0.024(0.709)	-
Cost income ratio	-	-	-	-	-0.066(0.000)***
Ln (Total assets)	0.966(0.000)***	0.760(0.003)***	1.013(0.000)***	0.744(0.002)***	0.680(0.000)***
Asset growth	0.008(0.340)	0.007(0.003)***	0.027(0.049)**	0.009(0.297)	0.007(0.251)
Assets/liabilities	0.003(0.921)	0.093(0.113)*	-0.009(0.743)	0.011(0.680)	0.051(0.000)***
Debt to equity	0.001(0.885)	-0.009(0.171)*	-0.000(1.000)	-0.007(0.385)	-0.010(0.056)**
Big 4 auditors (1/0)	-0.042(0.268)	-1.320(0.165)*	-1.045(0.337)	-1.426(0.119)*	-0.200 (0.783)
F-statistic	2.200	2.110	2.300	1.860	12.660
p-value	0.007**	0.011**	0.007**	0.029**	0.000***
D-W statistic	1.137	1.160	1.300	1.163	1.271
adj R^2	7.80%	7.20%	10.70%	5.80%	45.00%

The p-values are in parentheses with *, ** and *** denoting significance at the 10, 5 and 1% levels respectively. Source: 1998-2007 survey data, author's computation

The total number of observations is 410, which represents stacked data for the period 1998-2007 for the 41 commercial banks operating in Kenya. Five regression models were developed to test the five hypotheses developed earlier. Panels A and B present the results from the data.

Panel A: Regression of return on assets, core capital, equity capital, risk weighted capital, total capital and cost income ratio.

The OLS Regression equation used:

$$ROA_{it} = \alpha_0 + \alpha_1 CCR_{it} + \alpha_2 ECA_{it} + \alpha_3 TRC_{it} + \alpha_4 TCA_{it} + \alpha_5 CIR_{it} + \alpha_6 BS_{it} + \alpha_7 AG_{it} + \alpha_8 AL_{it} + \alpha_9 DE_{it} + \alpha_{10} Aud_{it} + D_t + \varepsilon_i \quad (1)$$

Table 4 presents regression estimates of the various capital adequacy determinants and cost to income ratio for the banks under study. The dependent variable is return on assets. Each of the regression models represents a regression of one of the independent variables against the dependent variable. For all regression models, the control and dummy variables have been incorporated. Firm year controls and variance inflation indicators (VIFs) have also been estimated but not reported.

Panel B: Regression of return on equity, core capital, equity capital, risk weighted capital, total capital and cost income ratio.

The OLS Regression equation used:

$$ROE_{it} = \alpha_0 + \alpha_1 CCR_{it} + \alpha_2 ECA_{it} + \alpha_3 TRC_{it} + \alpha_4 TCA_{it} + \alpha_5 CIR_{it} + \alpha_6 BS_{it} + \alpha_7 AG_{it} + \alpha_8 AL_{it} + \alpha_9 DE_{it} + \alpha_{10} Aud_{it} + D_t + \varepsilon_i \quad (2)$$

Table 5 presents regression estimates of the various capital adequacy determinants and cost to income ratio for all banks under study. The dependent variable is return on equity. Each of the regression models represents a regression of one of the independent variables against the dependent variable. For all regression models, the control variables and dummy variables have been incorporated. Firm year controls and Variance Inflation Indicators (VIFs) have also been estimated but not reported.

Table 5: Regression estimates of the various capital adequacy determinants and cost to income ratio for all banks under study. The dependent variable is return on equity

	Dependent Variable = Return on equity (ROE)				
Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-38.600(0.064)*	-59.000(0.035)**	-37.600(0.108)*	-32.97(0.119)*	-23.470(0.147)*
Core capital/assets	0.250(0.562)	-	-	-	-
Equity capital/assets	-	-0.488(0.453)	-	-	-
Core capital/risk weighted assets	-	-	0.314(0.057)**	-	-
Total capital/assets	-	-	-	-0.032(0.929)	-
Cost income ratio	-	-	-	-	-0.296(0.000)***
Ln (Total assets)	7.161(0.000)***	6.468(0.000)***	8.327(0.000)***	6.460(0.000)***	6.155(0.000)***
Asset growth	0.069(0.140)*	0.068(0.142)*	0.111(0.122)*	0.069(0.014)**	0.070(0.069)*
Assets/liabilities	-0.054(0.769)	0.271(0.384)	-0.190(0.185)*	-0.020(0.892)	0.064(0.293)
Debt to equity	-0.067(0.224)	-0.091(0.012)**	-0.114(0.113)*	-0.088(0.022)**	-0.095(0.002)***
Big 4 auditors (1/0)	-9.843(0.052)**	-10.823(0.034)**	-6.764(0.236)	-11.002(0.030)**	-5.777(0.177)*
F-Statistic	4.760	4.780	5.130	4.950	11.87
P-value	0.000***	0.000***	0.000***	0.000***	0.000***
D-W statistic	1.296	1.301	1.362	1.319	1.417
adjR^2	20.90%	20.90%	27.40%	21.90%	43.20%

The p-values are in parentheses with *, ** and *** denoting significance at the 10, 5 and 1% levels, respectively. Source: 1998-2007 survey data, author's computation

In the first model in both panels, I regress the core capital ratio (CCR) with bank profitability as measured by both ROA and ROE. The regression equation used is as follows:

$$ROA_{it}/ROE_{it} = \alpha_0 + \alpha_1 CCR_{it} + \alpha_6 BS_{it} + \alpha_7 AG_{it} + \alpha_8 AL_{it} + \alpha_9 DE_{it} + \alpha_{10} Aud_{it} + D_t + \varepsilon_i \quad (3)$$

The results indicate the core capital is positively related both profitability measures at significance level, α = 10% for ROA. These results are consistent with prior research that there exists a positive relationship between capital adequacy and profitability (Bourke, 1989; Berger, 1995).

In the second model, I regress the equity capital ratio (ECA) with profitability as measured by both ROA and ROE. The regression equation used to establish this is formulated as follows:

$$ROA_{it}/ROE_{it} = \alpha_0 + \alpha_2 ECA_{it} + \alpha_6 BS_{it} + \alpha_7 AG_{it} + \alpha_8 AL_{it} + \alpha_9 DE_{it} + \alpha_{10} Aud_{it} + D_t + \varepsilon_i \quad (4)$$

The results reveal that a negative relationship exists at for both measures of profitability and equity capital ratio. Although these findings are not significant, they are consistent with previous studies which find that a negative relationship between bank capital and profitability exists (e.g., Navapan and Tripe, 2003). The negative relationship can be explained by the fact that the more the equity providers to a bank, the higher the claim from the bank's retained earnings in the form of dividends. This leads to less retained funds available to the bank for growth purposes, hence less funds available to boost profits.

Next, I regress the risk based capital ratio (defined as core capital scaled by risk weighted assets) to profitability as measured by ROA and ROE. The results are shown under model 3 in both Panels A and B. The regression equation used is:

$$ROA_{it}/ROE_{it} = \alpha_0 + \alpha_7 TRC_{it} + \alpha_6 BS_{it} + \alpha_7 AG_{it} + \alpha_8 AL_{it} + \alpha_9 DE_{it} + \alpha_{10} Aud_{it} + D_t + \varepsilon_i \quad (5)$$

Consistent with Bourke (1989) and Berger (1995), the results indicate that a significant positive relationship exists between bank profitability and risk weighted capital at α = 5%.

In the fourth regression model, the total capital (both core capital and supplementary capital) has been regressed against ROA and ROE. The regression equation used is as follows:

$$ROA_{it}/ROE_{it} = \alpha_0 + \alpha_4 TCA_{it} + \alpha_6 BS_{it} + \alpha_7 AG_{it} + \alpha_8 AL_{it} + \alpha_9 DE_{it} + \alpha_{10} Aud_{it} + D_t + \varepsilon_i \quad (6)$$

This produces mixed results. The results indicate that a positive relationship exists between this total capital and bank profitability as measure by ROA, while a negative relation exists between the total capital ratio and profitability as measure by ROE. None of these results are significant.

In the fifth model, I regress the cost income ratio with bank profitability using the following regression equation:

$$ROA_{it}/ROE_{it} = \alpha_0 + \alpha_5 CIR_{it} + \alpha_6 BS_{it} + \alpha_7 AG_{it} + \alpha_8 AL_{it} + \alpha_9 DE_{it} + \alpha_{10} Aud_{it} + D_t + \varepsilon_i \quad (7)$$

Consistent with previous studies, there exists a negative relationship between the CIR and bank profitability at significance level, α = 1% for all regression models.

Finally, the significant negative constant coefficient in all regression models implies that if all the other variables were set to zero, then the bank would report a loss. This makes economic sense because if there was no capital, it is expected that the bank would not report any activity nor profits.

All models reveal that the larger the bank, the more profitable it is. This finding is highly significant at α = 1% for all regression models. This means that larger banks are more profitable compared to smaller banks. Consistent with this finding, all regression models also show that the bank asset growth has a significant positive relation to its profitability. This means that as the bank grows in its asset base (depicting an increase in its size), it reports higher profits since the assets are being used to generate more profits.

Table 6 shows the summary results of the expected signs from the study and the actual sign developed from the study data analysis.

All regression models were tested for multicollinearity. The Variance Inflation Factor (VIF) (not disclosed in the findings) is used to detect whether one predictor has a strong linear association with the remaining predictors (the presence of multicollinearity among the predictors) (Lazaridis and Tryfonidis, 2006). The VIF measures how much the variance of an estimated regression coefficient increases if your predictors are correlated (multicollinear).

Table 6: Summary findings on key variables

	Bank profitability as measured by ROA and ROE			
	Expected sign		Actual sign	
Variables	ROA	ROE	ROA	ROE
Intercept	-	-	-	-
Core capital/assets	+	+	+	+
Equity capital/assets	+	+	-	-
Core capital/risk weighted assets	+	+	+	+
Total capital/assets	+	+	+	-
Cost income ratio	-	-	-	-
Ln (Total assets)	+	+	+	+
Asset growth	+	+	+	+
Assets/liabilities	?	?	?	?
Debt to equity	-	-	?	-
Big 4 auditors	?	?	-	-

Source: 1998-2007 survey data, author's computation

The largest VIF among all predictors is often used as an indicator of severe multicollinearity. Montgomery *et al.* (2007) suggest that when VIF is greater than 5-10, then the regression coefficients are poorly estimated. In all the regression equations discussed above, all the predictors had a VIF ranging between 1 and 3 implying that there is absence of multicollinearity between the predictors in the regression models.

Figure 1 shows the time series plot of the CIR over the ten year period for all the 41 banks in the sample. The Figures have been calculated from the Banking Survey data (Think Business, 2009). The trend line shows that the CIR increased sharply in the periods 1999 to 2002, then fell in 2003, rose again in 2004 and it has been falling since then to 2007 where a 59.75% CIR was reported. This is due to the move by banks to improve their efficiency by employing robust information systems in banking which can handle large numbers of clients.

The trend can also be explained by the stiff competition in the banking sector in Kenya whereby even though there is extensive expansion, banks are keen on cutting their costs to either improve or maintain their profitability positions. Even though not captured completely in the figure, the effects of the global financial crisis of 2007/2008 seem not to have affected Kenyan banks as of 2007 because the CIR ratio was still low at 59.75% at this particular time of the study.

From the selected countries in Table 7, Kenya ranks 9th with an average CIR of 69.3% which, compared globally, is quite high. This means Kenyan banks need to strive hard to reduce their CIRs to global levels (50-60%) as indicated in Table 7. This will make them globally competitive. Being globally competitive will expose the banks to a wide range of global opportunities including global service offering and the possibility of being cross listed in global stock exchange markets. This has an added advantage such as the exposure to larger capital sources and a large clientele.

This study adds to the existing literature such as Navapan and Tripe (2003) who found out that the expected negative relationship between capital and profitability exists. The study also adds to previous findings that there is a positive relationship between capital adequacy and profitability (Bourke, 1989; Berger, 1995). This makes economic sense from the point of view that an increase in capital may raise expected earnings by reducing the expected costs of financial distress, including bankruptcy. This means that a bank can acquire more capital

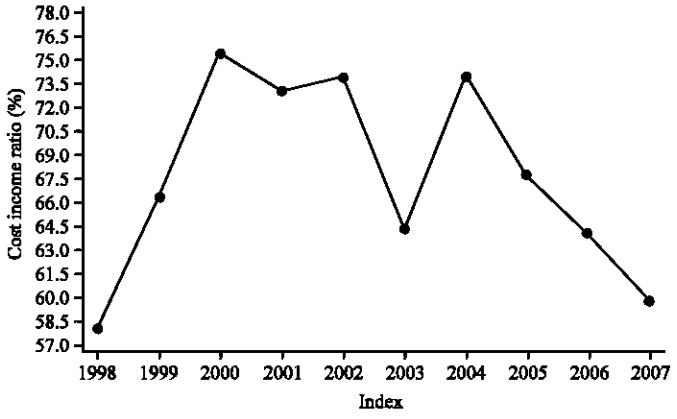

Fig. 1: The time series plot of the CIR over the ten year period for all the 41 banks in the sample. Source: 1998-2007 survey data, author's computation

Table 7: Comparison of CIR in some selected countries

Rank	Country	CIR* (%)
1	Canada	52.30
2	Switzerland	56.40
3	United States of America	63.40
4	United Kingdom	63.90
5	Germany	64.10
6	Australia	64.70
7	France	65.60
8	New Zealand	66.50
9	Kenya	69.30
10	Ice land	72.60

*Represents the CIR for the years 1998-2002. The data has been derived from OECD (2005) augmented by author's calculations. Source: 1998-2002 survey data, author's computation and secondary data (OECD, 2005)

to improve its more profits. A bank that acquires more capital is able to realize more returns by either investing this additional capital or even using it to generate a return on loans (in form of interest income). The differential relationships between bank profitability and capital can be explained by the fact that there are differential effects of the various measures of capital adequacy (due to risk measurement) on the profitability of the bank.

The study also reveals that the CIR is inversely related to both bank profitability measures. This finding adds to existing literature such as that of Ghosh *et al.* (2003) and Hess and Francis (2004) that there exists a negative relationship between the cost-income ratio and profitability.

CONCLUSIONS

This study examines the relationship between bank profitability, CARs and the CIR. While prior research documents that a positive or negative relation exists between CARs and bank profits and that a negative relation exists between the CIR and bank profitability, no study has addressed the more fundamental question of whether the two bank profitability measures are related to the CARs and CIR simultaneously.

Using ROA and ROE as proxies for bank profitability, the study finds that bank profitability is positively related with the core capital ratio and the risk-based capital. The study also shows that bank profitability is negatively related to the equity capital ratio and the CIR.

The most significant finding in this study which other similar studies have not pointed out is the fact that there are differential effects of the various measures of capital adequacy on the profitability of the bank. This study finds out that the non-risk weighted capital adequacy measure (i.e., the equity capital ratio) is negatively related with the profitability of a bank (as measured by both ROA and ROE) while there is a positive relationship between the risk-adjusted capital adequacy measure (i.e., tier 1 risk-based capital ratio and core capital ratio) and bank profitability (as measured by both ROA and ROE). The total capital ratio also reveals the same. These findings are significant in the sense that the risk adjustment helps to account for the uncertainty associated with bank's capital levels. This acts a reliable measure of the nature and the composition of capital inherent in a bank's capital structure.

Another major finding in the study is that the CIR is negatively related to both bank profitability measures. The study also reveals that the Kenyan banks CIRs are quite high compared to CIRs of developed countries. This means that Kenyan banks should strive to keep the CIR to its minimum, if possible, below the 50% threshold for them to be more efficient hence be globally competitive.

Future research could incorporate more variables such as taxation and other regulation indicators, exchange rates as well as indicators of the quality of the services offered by banks in the models used in this study. Another possible extension could be the use of dual regression models where the ROA and ROE variables are regressed at the same time with the various independent, control and dummy variables.

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