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Effects of Basel III higher capital requirements via bank lending rates in Africa: a preliminary assessment

Abstract

This paper focuses on the possible impact of the Basel III higher tier 1 capital (common equity) requirements on bank lending rates in four African countries (Egypt, Kenya, Nigeria and South Africa). In the methodology, an accounting model is employed to estimate the increase in the bank lending rates that is necessary to keep the bank return on equity (ROE) unchanged under the heightened regulatory capital framework. According to the estimates, the impact of the higher equity capital requirement on bank lending rates in Egypt, Kenya, Nigeria and South Africa would be 47.43, 32.41, 18.36 and 12.59 basis points increase (respectively) for every one percentage-point increase in the equity-capital ratio. Apart from increasing the bank lending rates, other alternatives that can be explored to keep the bank ROE unchanged are also provided in this paper.

Keywords: Basel III capital requirements, ROE, lending rates.
JEL Classification: G21, G28, E58.

Introduction

The horrifying scope of the 2008-2009 global financial crises, coupled with the drawbacks of Basel II, underscores the introduction of Basel III with higher tier 1 (equity) capital requirements in 2010. The basic idea behind the higher tier 1 (equity) capital requirements is to ensure that banks have sufficient capital to cover their risks, and to ensure that banks and banking systems are more resilient to economic and financial shocks. However, the nature and possible economic implications of the Basel III higher tier 1 capital requirements have been a subject of debates since its inception in 2010. A strand of the debates are based on the arguments that a higher equity capital requirement is necessary for low risk of bank failure, and for the protection of depositors (e.g. Admati et al., 2013). On the other hand, the opposing arguments emphasize that the use of higher equity capital relative to debt financing would lead to higher cost of financing for banks, and that the banks would pass the burden to borrowers through higher lending rates, leading to (1) low level of public borrowing, (2) a constraint to future expansion of banks and (3) a constraint to economic activities (see Cosimano and Hakura, 2011).

In spite of the debates, there are few empirical studies on the likely impact of the Basel III higher equity capital requirements on bank lending rates. This paper is one of the few studies. The approaches taken in this study focus on the likely impact of the Basel III higher equity capital requirements on commercial banks' lending rates in four African countries (Egypt, Kenya, Nigeria, and South Africa). In the analysis, it is assumed that banks adjust to higher equity capital requirements by reducing their most expensive form of liabilities (long-term debt) and increasing their common equity capital by an equal amount, leaving the total assets unchanged. The use of lower long-term debt financing and higher common equity capital reduces interest payment and increases net income, but the ROE would fall, all things being equal, as the relative rise in the net income (numerator of the ROE) is usually smaller than the increase in the common equity capital (denominator of the ROE). In this study, banks are expected to increase their lending rates by a margin to calibrate the reduction in ROE, with no change in the cost of debt and other cost (or income) drivers. Furthermore, the supply of bank credit is considered as an exogenous factor. In this sense, competitive pressures, elasticity of loan demand, and credit rationing are ignored.

Having into consideration the assumptions stated above, separate analysis is conducted for each of the four sampled countries by employing a stylized banking sector financial statement and an accounting equilibrium model. It is observed in the results that the effect of a one-percentage point increase in the equity capital ratio on ROE can be offset by increasing the lending rate by 47.43 bp, 32.41 bp, 18.36 bp and 12.59 bp in Egypt, Kenya, Nigeria, and South Africa, respectively. The results from this study would be important to investors, bank managements and bank regulators that want to have a prior knowledge of the possible effects of Basel III higher capital (equity) requirements in Africa. Furthermore, the results would provide an opportunity to compare the findings for other countries (see Biase, 2012; Kings, 2010; Slovik and Cournede, 2011; Šútorová and Teplý, 2013) with those of African countries. Moreover, the results can also serve as a guide for other developing countries that are in the process of adopting Basel III regulations.

It is important to state that the Basel accords are not internationally binding but have to be entrenched into national regulatory and supervisory guidelines. According to a questionnaire study conducted by the

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Financial Stability Institute in 2004, more than twenty two African countries (including Egypt, Kenya, Nigeria, and South Africa) had plans to adopt the Basel II accord. Currently, only South Africa has started the implementation of Basel III accord in the continent, while Egypt, Kenya, Nigeria and some other African countries have Basel II accord to be the regulatory standard in place. However, it is important to note that the adoption of Basel III higher capital requirements does not seem to be a great challenge to African banks. The tier 1 capital base of banks in Africa is typically high due to the low level of innovative hybrid instruments (Caggiano and Calice, 2011).

The remaining part of this paper is organized as follows. The Basel III capital requirements are discussed in Section 1. The literature review is provided in Section 2. Section 3 provides detailed information about the accounting model and the stylized financial statements that are used in this study, while the estimation results are presented in Section 4. The conclusion is provided in the final Section.

1. Looking at Basel III capital requirements

Basel III, introduced in December 2010, is the third and latest series of the Basel Accords. The Basel III Accord addresses a range of areas in risk management of the banking sector. However, equity (tier 1) capital requirement under the Basel III is the focus of this study. Other important areas of the Basel III such as liquidity coverage ratio and net stable funding ratio are not discussed in this section.

The levels of tier 1 capital required under the Basel III are: minimum core equity (tier 1) capital, countercyclical buffer, capital conservation buffer, surcharge on minimum capital requirements on Global Systemically Important Banks (GSIBs), and leverage ratio. These levels are discussed one after the other below.

1.1. Minimum core equity (tier 1) capital requirement. The minimum total regulatory capital ratio (TRCR) requirement by Basel II and Basel III is 8%. The main difference is the increase in the quality of capital requirement. Basel III reduces the maximum component of tier 2 capital and hybrid tier 1 capital in the RWAs from 4% to 2% and 2% to 1.5%, respectively, and increases the common equity tier 1 (CET1) from 2% to 4.5%, with full implementation in 2019 (see Figure 1). In essence, there is an improvement in the quality of capital.

1.2. Capital conservation buffer. The capital conservation buffer is designed to make banks to build up capital outside periods of crisis or stress which can be used to augment the required minimum capital as losses are incurred during periods of crisis. If the conservation buffer is depleted during periods of crisis, the banks are expected to rebuild it. They can achieve this by retaining their earnings which implies decreasing discretionary distributions of earnings (like share buy-backs, staff bonus and dividend payments). Alternatively, the banks may turn to the private sector to raise the new capital.

According to the BCBS (2011), the implementation of the buffer will start from January 2016 at a rate of 0.625% of RWAs and will increase by 0.625% on yearly basis and reach the 2.5% maximum value in 2019. The buffer is expected to be provided with common equity tier 1 capital (see Figure 1).

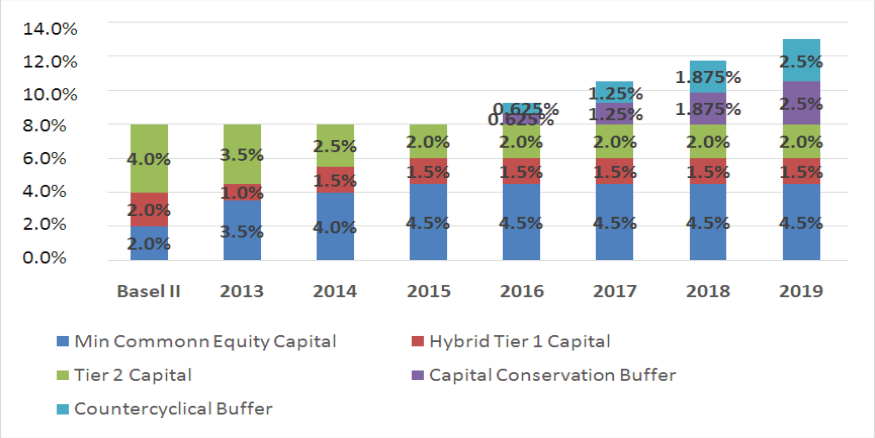
1.3. Countercyclical capital buffer. The Basel II methods (the Internal Ratings Based approaches) of calculating capital requirement for credit risk rely on probability of default (PD), which fluctuates over time based on financial and economic situations. "During a period of sustained economic growth, estimated probabilities of default are likely to fall, prompting lower minimum capital requirements per unit of risk-weighted assets under Basel II" (Arjani, 2009). The Basel II lower capital requirement during economic growth will enable banks to have more capital to provide loan; thereby amplify the build-up of systemic risk in the economy. In period of economic downturn, rising probabilities of default will force up the minimum required capital under Basel II and reduce the ability of banks to provide loans. This will subsequently aggravate the economic downturn.

The above scenario shows that the Basel II "regulatory capital requirements can be an important source of procyclicality that can amplify the credit cycle through periods of both boom and bust" (Chen and Christensen, 2010). The concern to reduce the procyclicality of Basel II capital requirement led to the introduction of countercyclical capital buffer (CCB) in Basel III, and its implementation was scheduled to start from January 2016.

The CCB is a precautionary control that obliges banks to build-up their capital gradually as systematic risk develops due to excessive credit growth, stemming from credit boom (good periods); the CCB can then be drawn down and used as a cushion against losses in periods of economic downturn (bad periods). The purpose of the CCB is to ensure that capital requirements in the banking system account for the macro-financial environment in which banks operate. This purpose differs from that of capital conservation buffer which is for individual bank's financial condition.

Three important submissions are entrenched in the Basel III CCB. First, the CCB is not the same as the mandatory minimum capital requirement. Instead, it is an additional capital to the minimum capital, which can be used to absorb losses in bad periods. Second, the CCB is set to range from 0 to 2.5 percent of RWAs, and it has to be provided with common equity tier 1 capital (see Figure 1). Third, the bank regulators are expected to use the deviation of credit-to-GDP

ratio from its long-term trend as a guide in imposing, adjusting and deactivating the CCB. When imbalances (gap) appear to be building up in the credit-to-GDP long-term trend, the CCB will be activated.



Sources: BCBS (2010) and Bhimalingam & Burns (2011).

Fig. 1. Basel III capital requirements (percentage of RWA)

1.4. Surcharge on minimum capital requirements on global systemically important banks (GSIBs). Surcharge on minimum capital requirements is an additional policy measure for only Global Systemically Important Banks (GSIBs). The implementation is proposed to start from 1 January 2016 and become fully effective in January 2019. The rationale behind the introduction of the additional capital surcharge is based on the ability of the GSIBs to produce cross-border negative externalities. The qualified banks are categorized into five different groups (called buckets). A bucket is assigned a capital surcharge within a range from 1% to 3.5% (1%, 1.5%, 2%, 2.5% and 3.5%) of RWAs – to be provided with common equity tier 1. The capital surcharge (or bucket) of a bank is determined by the bank's global systemic importance.

The BCBS sets the criteria for determining a bank's global systemic importance, using a quantitative "indicator-based measurement" which is calibrated on the following five variables: cross-jurisdictional activity of banks, their sizes, their complexity, their interconnectedness, and dearth of substitutes for the banks services (BCBS, 2011b). Each of these five variables are considered to have the same weight (20%) in determining a bank's global systemic importance.

1.5. Leverage ratio. Excessive deleveraging (orchestrated by market conditions) in the banking systems of many countries is widely claimed to be the underlying cause of the 2008-2009 global financial crisis. The excessive deleveraging resulted in decline of asset prices, which in turn resulted in decline of bank capital and massive contraction in credit availability. In order to prevent the reoccurrence of the excessive deleveraging, the BCBS supplements the capital adequacy requirements with a non-risk based leverage ratio, specified as tier 1 capital to total assets. According to the BCBS (2011a), the ratio is introduced to achieve two main objectives. First, the ratio is intended to serve as a backstop and mitigate uncertainties and measurement error that can stem from the risk-based method. Second, the intention is to contain the build-up of leverage in the banking sector – trying to prevent destabilising deleveraging from happening in the financial system.

The Basel III leverage ratio can be viewed as both microprudential and macroprudential tools. It performs the microprudential function by putting a limit on the level to which a bank can build up leverage in its capital structure; it serves as a macroprudential instrument by preventing the banking sectors from the risk of building up excessive leverage.

The formula for calculating the Basel III leverage ratio is provided below. A trial of minimum limit of 3% is set to start from 2013, with a view to review and set a binding limit on 1 January 2018 (BCBS, 2011a).

$$Basel\ III\ Leverage\ Ratio \frac{Tier1\ Capital}{Total\ Assets} 3\%. \qquad (1)$$

2. Studies on the effect of higher capital requirements via lending rates

Bank capital requirement is the amount of capital that a bank has to hold as required by the bank's regulator. This requirement is set to strengthen the ability of banks to absorb losses, to withstand economic shocks, and to protect depositors. Basel III, introduced in December 2010, is the third and latest series of the Basel Accords on bank capital requirements. The possible effects of the Basel III higher tier 1 capital requirements on bank lending rates have attracted the interest of academic researchers. For example, King (2010) develops an accounting model to map the higher capital requirements under the Basel

III capital framework to bank lending spreads. Using a representative bank's financial statement for 6,844 banks in thirteen OECD countries over a period of fifteen years (1993-2007), the author shows that a 15-basis point increase in lending spread is required to preserve the ROE (for a representative bank) when the regulatory capital ratio is increased by one percentage point (pp).

The lending rate implications of the higher regulatory capital is also examined by Elliot (2010). The analysis of Elliot (2010) is based on a stylized accounting method. In the author's stylized model, the funding for banks' loans comes from equity, debt and deposits. Using the aggregate data for the US banking system, as reported by the Federal Deposit Insurance Corporation (FDIC), the estimates of the author show that if the common equity ratio is increased by two-percentage point (from six to eight) and without any other adjustment, banks would need a 39-basis point increase in their lending rates to preserve a return on equity of 15%. In the concluding part of the paper, the author reiterates that the US banking system can use a combination of actions to adjust to higher capital requirements in such a way that the availability or pricing of banks loans would not be strongly affected.

Another study by Kashyap et al. (2010) is based on the effect of "substantially heightened" capital adequacy requirements on bank customers. The authors identify three proxies (I. the net interest margin, II. the earning yield on loans, and III. the difference between the prime rate and the rate on short-term Treasury bills) for the spread or mark-up that banks charge on their loans to customers. Using data of commercial banks in the U.S. from 1920 to 2009, the authors regress each of the three proxies on the aggregate equity-to-assets ratio and find no discernible impact of equity-assets (or financial leverage) on any of their three proxies for mark-up, aside from the tax shield on debt. Following the Modigliani and Miller (1958) theory of capital structure, the authors assert that higher equity-capital requirements reduce the tax benefits of debts and thereby lead to an increase in the weighted average cost of capital (WACC) of banks. In their baseline calibration, each percentage point increase in equity to assets ratio raises the bank lending rate by 2.5 basis points. A literary interpretation is not proper for these estimates since the authors use equity to total assets in the calibration, which is different from equity to RWAs.

Cosimano and Hakura (2011) also offer an empirical explanation on the impact of the Basel III capital requirements on bank lending rates. Using the generalized method of moment (GMM) method to estimate the data of the 100 largest commercial banks in the world (in terms of total assets), the authors assert that a higher equity-capital requirements will increase the lending rates of banks. The findings also indicate that the impact of higher capital regulation will vary from one country to another, depending on the elasticity of loan demand and the cost of raising new equity capital in each country. On the average, the authors show that the lending rates of the world 100 largest commercial banks will increase by 0.12 percentage point for a percentage increase in the equity-total assets ratio.

More recently, Biase (2012) focuses on the Italian banking sector. Using a stylized banking sector financial statement and an accounting model, the estimates of the author indicate that the Basel III capital adequacy requirements will have a small effect on bank lending rates in the country. In the baseline calibration of the author, each percentage point increase in the capital adequacy ratio raises the bank lending rate by 5.75 basis points. This type of study is very important in Africa where the financial sectors are dominated by commercial banks. In this sense, this study focuses on the likely impact of the Basel III higher equity capital requirements on commercial banks' lending rates in four African countries (Egypt, Kenya, Nigeria, and South Africa). To the best of my knowledge, this is the first empirical study on this topic relating to African countries. Drawing from the literature, the next section presents the methodology used in this study.

3. Data and methodology

This section discusses an accounting equilibrium model, a stylized bank sector income statement and balance sheet that are employed to achieve the objective of this study. The assumptions underlying the accounting model are also stated.

3.1. The model. A typical bank's income statement is composed of expenses and income items. The income items include interest income on loans to customers (*IntIncLoans*), other interest income (*OtherIntInc*), and non-interest income (*NonIntInc*). The expenses section contains operating expenditures (*OpExp*), non-operating expenses (*NonOpExp*) and interest expenses (*IntExp*). Operating expenditures (*OpExp*) are costs that are incurred in carrying out day to day activities of the bank. Interest expenses relate to payable on customer deposits, short-term funding, and long-term funding. Total revenues minus operating and non-operating expenses, and taxes represent net income (*NI*) as specified in Equation 2 below:

$$NI = \left[\left(IntIncLoans + OtherIntInc - IntExp \right) + NonIntInc - OpExp - NonOpExp \right] \times \left(1 - tax \right). \quad (2)$$

A typical bank's balance sheet is made up of assets and liabilities. The total assets (*Asts*), Equation 3, include cash and cash equivalents (*CCE*), interbank claims (*IBC*), loans, investments (*Inv*), and other assets (*OA*). The liabilities (Liab), Equation 4, include deposits (*Dep*), interbank funding (*IBF*), trading li-

abilities (*TL*), short-term liabilities (*STL*), wholesale funding (*WF*), and other liabilities (*OL*).

$$Asts = CCE + IBC + Loans + Inv + OA. \quad (3)$$

$$Liab = Dep + IBF + TL + STL + \\ + TL + WF + OL. \quad (4)$$

It is important to clarify the difference between the bank total assets and the bank risk weighted assets (*RWAs*). The *RWAs* are assets adjusted for risk. The calculation of the *RWAs* is captured with the Equation 5 below:

$$Total\ RWAs = \sum_{t=1}^{n} Asset_i \times Risk\_Weight_i, \quad (5)$$

where *n* is the number of risk categories of a bank's assets, and *Risk_Weight* is the default weight assigned to the categories. In a regulatory capital context, the *Total RWAs* is used to estimate regulatory capital ratio; it is usually lower than the total assets recorded on the bank's balance sheet.

The focus of this study is to quantify the potential effect of the Basel III higher common equity tier 1 (CET1) regulatory capital ratio on bank lending rates. This study follows King (2010) and Biase (2012), and calculate the equity-capital ratio by dividing the book value of equity (*EQ*) by the risk-weighted assets (*RWAs*). The equity-capital ratio (*CR*) is here used as a proxy for the CET1 regulatory capital ratio.

$$CR = \frac{EQ}{RWAs}.$$

$$EQ = CR \times RWAs. \quad (6)$$

The new equity capital, resulting from the capital regulation, can be illustrated with the equation bellow.

$$EQ_{t+1} = EQ_t + \Delta CR \times RWAs. \quad (7)$$

Where EQ_t is the value of the equity before the capital regulation, ΔCR is the required percentage point increase in the capital ratio, and EQ_{t+1} is the new equity resulting from the capital regulation.

The size and components of the balance sheet are assumed to be constant in this study, but the relative size of equity to debt funding can be altered to meet the new Basel III capital requirement. Thus, it is assumed that the increase in the equity capital (as shown in Equation 8) is matched by an equal decrease in debt, so that the size of the balance sheet remains unchanged. Accordingly, Equation 8 is stated below.

$$\Delta EQ = -\Delta D = \Delta CR \times RWAs, \quad (8)$$

where $-\Delta D$ is the negative change in the bank debt, and ΔEQ is the positive change in the bank equity. The negative change in debt should lead to a negative change in interest expenses. This relationship is expressed with the equation below:

$$-\Delta IntExp = IntExp_{t+1} - IntExp_t = -\Delta D \times C_{LD} = \\ = \Delta CR \times RWAs \times C_{LD}. \quad (9)$$

Where $-\Delta IntExp$ is the negative change in the interest expenses ($IntExp_{t+1} - IntExp_t$) and C_{LD} is the cost of long-term debt. The use of the cost of long-term debt implies that the increase in the equity capital would be offset through a decrease in long-term debt. Banks would prefer to reduce the long-term debt as it has the highest cost among the liabilities. Using Equation 10, the cost of long-term debt is distinguished from the cost of customer deposit, short-term debt, and equity. Equation 10 is in line with the Modigliani-Miller (M-M) theory of capital structure.

$$Cost_{customer\ deposit} < Cost_{short\text{-}term\ debt} < \\ < Cost_{long\text{-}term\ debt} < Cost_{Equity.} \quad (10)$$

The costs of customer deposits, short-term debt and long-term debt are not separately disclosed in banks' financial statements. Instead, the aggregate costs of the liabilities are reported as total interest expenses in the income statement. Using the ratio of total interest expenses to average interest bearing liabilities, the cost of the long-term debt may be calibrated as provided in the Equation 11 and Equation 12 below. A similar approach has been used by King (2010).

$$C_{CD} < x < C_{LD.} \quad (11)$$

$$C_{LD} = x + 0.02. \quad (12)$$

The cost of customer deposit (C_{CD}) is set to be less than x. The cost of long-term debt (C_{LD}) is assumed and set equal to be *x* plus 200 basis points, where x is calculated by dividing total interest expenses by average interest bearing liabilities. The average interest bearing liabilities is calculated as the total interest bearing liabilities at the beginning of the calendar year plus the total interest bearing liabilities at the end of the calendar year, divided by two. The average of interest bearing liabilities is used rather than interest bearing liabilities at the end of the calendar year because interest expense is a flow variable made during the calendar year.

Using Equation 9, the new interest expenses resulting from lower long-term debt is captured with Equation 13 below:

$$IntExp_{t+1} = IntExp_t - \Delta IntExp = IntExp_t - \Delta D \times C_{LD} = IntExp_t - \Delta CT1CR \times RWAs \times C_{LD}. \quad (13)$$

Since the reduction in the long-term debt leads to a decrease in the interest expenses (recalling Equation 9), the net income increases. While the net income expands, the *ROE* actually decreases as the relative

rise in the net income (numerator of the *ROE*) is usually smaller than the increase in the equity capital (denominator of the *ROE*). In order to avoid the decrease in *ROE*, banks can reduce their operating expenses or increase their efficiency. However, it is assumed in this study that banks avoid the decrease by raising their lending rates (α) to generate extra income on loans that will exactly maintain the baseline ROE_t. While the lending rates are increased, this study further assumes that all items in the income statement are constant except income on loans to customers, and interest expenses. The increase in the lending rate (α) is captured in Equation 14.

$$IntIncLoans_{t+1} = IntIncLoans_t + \alpha Loans_{t+1}.$$

$$\alpha = \frac{\left[IntIncLoans_{t+1} - IntIncLoans_t\right]}{Loans_{t+1}}. \quad (14)$$

Equation 15 calibrates the amount of increase in lending rates that would generate the exact extra income which would keep the *ROE* unchanged. Thus, offsetting the effect of higher equity capital requirements (EQ_{t+1}).

Apart from increasing the interest rates (a) on loans to generate the extra income (*ExrInc*), there are other alternatives that can be explored to generate the *ExrInc*.

$$\alpha = \frac{\left[\frac{(ROE_{t+1}.EQ_{t+1})}{(1\text{-}tax)} - (OtherIntInc_{t+1} - IntExp_{t+1} + NonIntInc_{t+1} - OpExp_{t+1} - NonOpExp_{t+1})\right] - IntIncLoans_t}{Loans_{t+1}}. \quad (15)$$

For examples, bank could increase non-interest operating income (*NIOI*), reduce personnel expenses (*PE*), or reduce other operating expenses (*OOE*). The *ExrInc*, and the percentage changes in non-interest operating income, personnel expenses, and other operating expenses, required to achieve the *ExrInc* are expressed with the following equations:

$$ExrInc = \alpha Loans_{t+1}, \quad (16)$$

$$\pi = \frac{ExrInc}{NIOI_t} \times 100 . \quad (17)$$

$$\theta = -\frac{ExrInc}{PE_t} \times 100 . \quad (18)$$

$$\beta = -\frac{ExrInc}{OOE_t} \times 100. \quad (19)$$

Where: π is the percentage increase in *NIOI*, θ is the percentage decrease in *PE*, and β is the percentage decrease in OOE, which are required to achieve the *ExrInc* that will keep the ROE and lending rates unchanged.

3.2. Description of data and stylized financial statements. In order to examine the potential effect of the Basel III higher CET1 capital requirement on bank lending rates, a stylized banking sector income statement and balance sheet is developed for each-country of study, using an approach which is similar to that of Biase (2012) and King (2010). Three steps are involved in developing the stylized banking sector income statement and balance sheet. First, income statements and balance sheets of commercial banks in each of the countries are obtained from the Bankscope. Second, an average income statement and balance sheet is generated for each bank by calculating the average values of items in its income statements and balance sheets. The average is chosen in order to normalize the accounting data to a steady-state, and to isolate possible reporting error (Biase, 2012; King, 2010).

The third step is taken by constructing a stylized banking sector balance sheet and income statement for each country, using the weighted average values of results from the second step. Total assets (as at the end of 2013) are used in generating the weights for the sampled banks in each country. Table 1 provides the details about the sampled banks in the countries. The stylized balance sheets and income statements for the countries are presented in Table 2, Table 3, and Table 4.

Table 1. Sampled commercial banks by country

Country	Egypt	Kenya	Nigeria	South Africa
Number of banks	13	14	14	7
Period	2011-2013	2011-2013	2011-2013	2011-2013

Table 2. Stylized balance sheet and income statement of commercial banks in Egypt, 2011-2013

Balance sheet	EGP (million)	Income statement	EGP (million)
Loans and advances to banks	13, 203.58	Interest income on loans to customers	9,635.36
Net loans	55,187.15	Other interest income	4,552.49

Table 2 (cont.). Stylized balance sheet and income statement of commercial banks in Egypt, 2011-2013

Balance sheet	EGP (million)	Income statement	EGP (million)
Other assets	109,096.83	Interest income	14,187.84
Total assets	177,487.56	Interest expenses	9,331.06
		A. Net interest income	4,856.78
Total liabilities	168,270.79	B. Total non-interest operating income	1,446.69
Equity	9,216.77	C. Total income (A+B)	6,303.47
Total liabilities & equity	177,487.56	D. Personnel expenses	1,529.35
		E. Other operating expenses	1,253.75
		F. Total operating expenses (D + E)	2,783.10
Risk weighted assets	86,219.69	G. Total non-operating expenses	63.06
Interest expense/average interest-bearing liabilities (%)	5.15%	H. Profit before tax (C-F-G)	3,457.31
Equity capital ratio (%)	10.69%	I. Tax	1,639.10
		J. Net income (H-I)	1,818.21

Source: Authors' computation with data from Bankscope.

Table 3. Stylized balance sheet and income statement of commercial banks Kenya, 2011-2013

Balance sheet	KES (million)	Income statement	KES (million)
Loans and advances to banks	10,818.15	Interest income on loans to customers	16,031.99
Net loans	110,180.59	Other interest income	3,773.47
Other assets	69,942.22	Interest income	19,805.46
Total assets	190,940.96	Interest expenses	097.27
Total liabilities	162,603.72	A. Net interest income	14,708.19
Equity	28,337.24	B. Total non-interest operating income	7,717.97
Total liabilities & equity	190,940.96	C. Total income (A+B)	22,426.16
Risk weighted assets	130,088.00	D. Personnel expenses	5,890.23
Interest expense/average interest-bearing liabilities (%)	4.17%	E. Other operating expenses	6,176.60
		F. Total operating expenses (D+ E)	12,066.83
Equity capital ratio (%)	21.78%	G. Total non-operating expenses	833,29
		H. Profit before tax (C-F-G)	9,526.04
		I. Tax	2,671.47
		J. Net income (H-I)	6,854.57

Source: Authors' computation with data from Bankscope.

Table 4. Stylized balance sheet and income statement of commercial banks Nigeria, 2011-2013

Balance sheet	NGN (billion)	Income statement	NGN (billion)
Loans and advances to banks	144.98	Interest income on loans to customers	96.83
Net loans	789.98	Other interest income	55.97
Other assets	951.70	Interest income	152.79
Total assets	1,886.66	Interest expenses	46.24
Total liabilities	1,644.48	A. Net interest income	106.55
Equity	242.18	B. Total non-interest operating income	46.56
Total liabilities & equity	1,886.66	C. Total income (A+B)	153.11
Risk weighted assets	1,167.50	D. Personnel expenses	37.42
Interest expense/average interest-bearing liabilities (%)	3.78%	E. Other operating expenses	57.02
		F. Total operating expenses (D + E)	94.44
Equity capital ratio (%)	20.74%	G. Total non-operating expenses	14.37
		H. Profit before tax (C-F - G)	44.30
		I. Tax	5.80
		J. Net income (H-I)	38.50

Source: Authors' computation with data from Bankscope.

Table 5. Stylized balance sheet and income statement of commercial banks in South Africa, 2011-2013

Balance sheet	ZAR (million)	Income statement	ZAR (million)
Loans and advances to banks	58,084.20	Interest income on loans to customers	39,616.05
Net loans	486,798.41	Other interest income	4,725.16
Other assets	196,907.24	Interest income	44,387.00
Total assets	741,789.85	Interest expenses	23,478.50
Total liabilities	687,578.49	A. Net interest income	20,908.50
Equity	54,211.36	B. Total non-interest operating income	17,298.64
Total liabilities & equity	741,789.85	C. Total income (A+B)	38,207.14
Risk weighted assets	380,814.63	D. Personnel expenses	11,818.23
Interest expense/average interest-bearing liabilities%	3.86	E. Other operating expenses	9,920.46
		F. Total operating expenses (D+ E)	21,738.69
Equity capital ratio (%)	14.24	G. Total non-operating expenses	5,219.50
		H. Profit before tax (C-F-G)	11,248.95
		I. Tax	2,829.07
		J. Net Income (H-I)	8,419.88

Source: Authors' computation with data from Bankscope.

4. Results

4.1. Linking higher equity capital requirements to bank lending rates. Using Equation 15 and the stylized financial statements (Tables 2-5), the increases in lending rates that are needed to keep the ROE constant for commercial banks in the four countries are estimated in this section.

As assumed, the regulation will lead to changes in the equity (EQ), debt, income on loans to customeros and interest expenses, while the tax rate and other items in the financial statements are assumed to be constant. For 1 percentage point increase in the equity-capital ratio in Egypt, the EQ_{t+1} is 10,079.08 (i.e., 86.219.69 × 0.1169); the $IntExp_{t+1}$ is 9.269.41 (i.e., 9,331.06 – 862.20 × 0.0715). The ROE_{t+1}, *tax rate*, $OtherIntInc_{t+1}$, $NonIntInc_{t+1}$, $OpExp_{t+1}$, $NonOpExp_{t+1}$, $IntIncLoans_t$, and $Loans_{t+1}$ are 19.73%, 47.41%, 4.552.49, 1.446.69, 2.783.10, 63.06, 9.635.36, and 55.189.15, respectively. Plugging those values into Equation 15 leads to Equation 20 below.

$$\alpha_{Egypt} = \frac{\left[\frac{(0.1973\times 10,079.08)}{(1-0.4741)} - (4,552.49 - 9,269.41 + 1,446.69 - 2,783.10 - 63.06)\right] - 9,635.36}{55,187.15} = \tag{20}$$

$$= 47.43 \textit{ basis points.}$$

Equation 20 implies that a 47.43 basis-point (bp) increase in lending rate would be necessary for a bank in Egypt to maintain its *ROE* of 19.73% when the equity-capital ratio is increased by 1 pp.

For 1 percentage point increase in the equity-capital ratio in Kenya, the EQ_{t+1} is estimated to be 29,634.05 (i.e., 130,088.00 x 0.2278). The $IntExp_{t+1}$ is 5,017.01 (i.e., 5,097.27 – 1,300.88 x 0.0617). The ROE_{t+1}, *tax rate*, $OtherIntInc_{t+1}$, $NonIntInc_{t+1}$, $OpExp_{t+1}$, $NonOpExp_{t+1}$, $IntIncLoans_t$, and $Loans_{t+1}$ are 24.19%, 28.04%, 3,773.47, 7,717.97, 12,066.83, 833.29, 16,031.99, and 110,180.59, respectively. Plugging those values into Equation 15 transforms into Equation 21 as follows.

$$\alpha_{Kenya} = \frac{\left[\frac{(0.2419\times 29,634.05)}{(1-0.2804)} - (3,773.47 - 5,017.01 + 7,717.97 - 12,066.83 - 833.29)\right] - 16,031.99}{110,180.59} = \tag{21}$$

$$= 32.41 \textit{ basis points.}$$

Equation 21 indicates that a 32.41 basis-point increase in lending rate is required to offset the effect of 1 pp increase in equity-capital ratio in Kenya.

Using the stylized financial statements of commercial banks in Nigeria, a 1 percentage point increase in the equity-capital ratio generates 253.81 for EQ_{t+1}. (i.e., 1,167.5 × 0.2174). This change results in 45.57 (i.e., 46.24 – 11.63 × 0.0578) for the $IntExp_{t+1}$. The *ROE*, *tax rate*, *OtherIntInc*, *NonIntInc*, *OpExp*, *NonOpExp* and *Loans* are assumed to be constant. Plugging the values into Equation 15 leads to Equation 22 below.

$$\alpha_{Nigeria} = \frac{\left[\frac{(0.159 \times 253.81)}{(1-0.1309)} - (55.97 - 45.57 + 46.56 - 94.44 - 14.37)\right] - 96.83}{789.98} = \tag{22}$$
$$= 18.36 \textit{basis points.}$$

Equation 22 shows that a 18.36 basis-point increase in lending rate would be necessary for a bank in Nigeria to maintain its *ROE* of 15.9% when the equity-capital ratio is increased by 1 pp.

For 1 percentage point increase in the equity-capital ratio in South Africa, the EQ_{t+1} is estimated to be 58.036.15 (i.e., 380.814.63 × 0.1524). The $IntExp_{t+1}$ is 23.254.37 (i.e., 23.478.5 – 3.824.79 × 0.0586). Plugging those values into Equation 15 transforms into Equation 23 as follows.

Equation 23 (see below) indicates that the effect of 1 pp increase in equity-capital ratio in South Africa can be offset by a 12.59 bp increase in lending rate.

$$\alpha_{South\ Africa} = \frac{\left[\frac{(0.1553 \times 58{,}036.15)}{(1-0.2515)} - (4{,}725.16 - 23{,}254.37 + 17{,}298.64 - 21{,}738.69 - 5{,}219.5)\right] - 39{,}616.05}{486{,}798.41} = \tag{23}$$
$$= 12.59 \textit{basis points.}$$

Having outlined the effect of a 1 pp increase in equity-capital ratio on bank lending rates, Table 6 presents the effects of higher pp increase in equity-capital ratio on bank lending rates for the sampled countries, by assuming an increment of 1 pp in the equity-capital ratio from its previous value. The relationships are approximately linear, with each one percentage point increase in the equity-capital ratios leading to a progressive increment of 47.43 bp, 32.41 bp, 18.36 bp and 12.59 bp in bank lending rates in Egypt, Kenya, Nigeria and South Africa, respectively.

It is clear in Table 6 that the required changes in lending rate vary from one country to another. Among the countries, changes (in lending rates) required to keep ROE unchanged is smallest for South Africa recording 12.59 bp for 1 pp increase in equity-capital ratio, followed by Nigeria, Kenya and Egypt, respectively. These results suggest that the implementation of the Basel III higher equity capital requirements is likely to have smaller effect on lending rates in South Africa and Nigeria, compared to Egypt and Kenya.

Table 6. Impact of higher equity capital requirements on lending rates for sampled countries

Increase in equity-capital ratio (percentage points)	Increase in lending rates per 1pp increase in equity-capital ratio			
	Egypt	Kenya	Nigeria	South Africa
1%	47.43 bp	32.41 bp	18.36 bp	12.59 bp
2%	94.87 bp	64.81 bp	36.86 bp	24.24 bp
3%	142.3 bp	97.22 bp	55.35 bp	35.89 bp
4%	189.73 bp	129.62 bp	73.84 bp	47.53 bp
5%	237.17 bp	162.03 bp	92.33 bp	59.18 bp

A comparison of the findings in this study with those of other related studies is provided in Table 7.

Table 7. Impact of 1 pp increase in capital ratio on bank lending rates

Authors	Studied ratio	Country	Increase in bank lending rates
Biase (2013)	Equity/RWA	Italy	5.75 bp
Cosimano & Hakura (2011)	Common equity ratio	Global	12.2 bp
Kashyap et al. (2010)	Equity/total assets	USA	2.5 – 4.5 bp
King (2010)	Equity/RWA	13 OECD countries	15 bp
Šútorová & Teplý (2013)	Common equity ratio	EU	18.8 bp
Slovik & Cournede (2011)	Common equity ratio	USA, Euro Area, Japan	20.5 bp (USA), 14.3 bp (Euro Region), 8.4 bp (Japan)
This author	Equity/RWA	EG, KE, NG, ZA	47.43 bp (EG), 32.41 bp (KE), 18.36 bp (NG), 12.59 bp (ZA)

Source: Compiled by the authors.
Note: EG, KE, NG and ZA represent Egypt, Kenya, Nigeria and South Africa, respectively.

4.2. Alternatives to increasing lending rates. Apart from increasing the interest rates (α) on loans to generate the extra income (*ExrInc*), there are other alternatives that can be explored to generate the extra in-

come that is needed to keep the *ROE* unchanged. Table 8 displays how the stylized banks could generate the extra income, either by increasing non-interest operating income (*NIOI*), or by decreasing personnel expenses (*PE*) or other operating expenses (*OOE*).

The required extra income (column three of Table 8) is based on Equation 16. Using the stylized financial statements, 261.75 million (EGP), 357.10 million (KES), 1.57 billion (NGN) and 612.88 million (ZAR) extra incomes are needed by the stylized Egyptian bank, Kenyan bank, Nigerian bank and South African bank, respectively, to keep their *ROE* unchanged when the equity-capital ratio is increased by 1 pp.

Using Equation 17 and the stylized financial statements, the extra incomes could be generated by the stylized Egyptian bank, Kenyan bank, Nigerian bank and South African bank by increasing their *NIOI* by 18.09%, 4.63%, 3.37% and 3.54%, respectively, for each 1 pp upward adjustment in the equity-capital ratio.

Alternatively (using Equation 18), the extra income could be reached by the stylized Egyptian bank, Kenyan bank, Nigerian bank and South African bank by reducing their *PE* by 17.12%, 6.06%, 4.19% and 5.19%, respectively, to keep their *ROE* unchanged when the equity-capital ratio is increased by 1 pp.

As another alternative (using Equation 19) to keep their *ROE* unchanged, the stylized Egyptian bank, Kenyan bank, Nigerian bank and South African bank could reduce their *OOE* by 20.88%, 5.78%, 2.75% and 6.18%, respectively, for each 1 pp upward adjustment in the equity-capital ratio.

Table 8. Impact of higher equity capital requirements on non-interest expenses and income

	Increase in equity-capital ratio (percentage point)	Required *exrinc*	Increase in *NIOI*	Decrease in *PE*	Decrease in *OOE*
Egypt	1%	EGP261.75 million	18.09%	17.12%	20.88%
	2%	EGP523.56 million	36.19%	34.23%	41.76%
	3%	EGP785.31 million	54.28%	51.35%	62.64%
	4%	EGP1047.07 million	72.38%	68.46%	83.51%
	5%	EGP1308.87 million	90.47%	85.58%	104.40%
Kenya	1%	KES357.10 million	4.63%	6.06%	5.78%
	2%	KES714.08 million	9.25%	12.12%	11.56%
	3%	KES1071.18 million	13.88%	18.19%	17.34%
	4%	KES1428.16 million	18.50%	24.25%	23.12%
	5%	KES1785.26 million	23.13%	30.31%	28.90%
Nigeria	1%	NGN1.57 billion	3.37%	4.19%	2.75%
	2%	NGN3.14 billion	6.75%	8.41%	5.52%
	3%	NGN4.72 billion	10.14%	12.62%	8.28%
	4%	NGN6.30 billion	13.53%	16.84%	11.05%
	5%	NGN7.88 billion	16.92%	21.06%	13.82%
South Africa	1%	ZAR612.88 million	3.54%	5.19%	6.18%
	2%	ZAR1180.0 million	6.82%	9.98%	11.89%
	3%	ZAR1747.12 million	10.10%	14.78%	17.61%
	4%	ZAR2313.75 million	13.38%	19.58%	23.32%
	5%	ZAR2880.87 million	16.65%	24.38%	29.04%

Note: *ExrInc*, *NIOI*, *PE* and *OOE* stand for extra income, non-interest operating income, personnel expenses and other operating expenses, respectively.

Conclusion

This paper focuses on the possible impact of the Basel III higher capital (equity) requirements on bank lending rates in four African countries (Egypt, Kenya, Nigeria and South Africa). It is assumed that banks would meet the new heightened capital requirements by altering the relative size of their equity-capital to debt funding. However, the substitution of debt with more expensive equity-capital to meet the new Basel III higher capital requirement may lead to a decrease in the ROE of banks. In order to avoid the decrease in the ROE, it is assumed in this study that banks would increase their lending rates. The required increase in the lending rate is calibrated by using an accounting model where all the components of balance sheet and income statement are assumed to be constant except the long-term debt, equity, interest expenses on loans, and interest income on loans to customers. Separate analysis is conducted for each of the four sampled African countries, considering the fact that the responses of banks to Basel III may be different from one country to another. Among the four African countries, changes (in lending rates) required to keep ROE unchanged is smallest for South Africa, recording 12.59 bp for 1 pp increase in equity-capital ratio. South Africa is followed by Nigeria, Kenya and Egypt, respectively. These results suggest that the implementation of the Basel III higher equity capital requirements is

likely to have smaller effect on lending rates in South Africa and Nigeria, compared to Egypt and Kenya.

Nevertheless, there are other alternatives that banks could explore to avoid the decrease in their ROE. This paper estimates that the stylized Egyptian bank, Kenyan bank, Nigerian bank and South African bank could increase their NIOI by 18.09%, 4.63%, 3.37% and 3.54%, respectively, for each 1 pp upward adjustment in the equity-capital ratio. Alternatively, it is shown that extra income could be generated by the stylized Egyptian bank, Kenyan bank, Nigerian bank and South African bank by reducing their PE by 17.12%, 6.06%, 4.19% and 5.19%, respectively, to keep their ROE unchanged when the equity-capital ratio is increased by 1 pp. As another alternative to keep their ROE unchanged, this paper estimates that the stylized Egyptian bank, Kenyan bank, Nigerian bank and South African bank could reduce their OOE by 20.88%, 5.78%, 2.75% and 6.18%, respectively, for each 1 pp upward adjustment in the equity-capital ratio.

Despite the coverage of this study, it is important to acknowledge that the assumptions/approach used in this study has its limitations. First, it ignores the alternatives faced by banks in adjusting their capital structures. Second, the estimates of the approach are not centered on an optimization in a general equilibrium setting. In addition, theory suggests that the cost of debt should reduce as the increase in the equity ratio will reduce the default risk. Nonetheless, the assumptions in this study are conservative, and they provide a starting point for understanding the behavioral response of banks to a change in capital requirement. The assumptions are also used by King (2010).

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