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Bank Capital and Credit Supply: Evidence from Commercial Banks in Ivory Coast

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Abstract

The aim of this paper is to examine the impact of the minimum capital requirements of commercial banks on credit supply in Ivory Coast, over the period from 2004 to 2015. To this end, the study was conducted from a panel of 14 Ivorian banks. From a GLS model, the results reveal that the increase in bank capital positively influences credit supply. However, the effects of capital increase on credit supply are annihilated by banking risk. Thus, the West African Economic and Monetary Union (WAEMU) Banking Commission needs to increase supervision so that banks can meet the minimum level of capital required to guarantee the solvency and resilience of the Ivorian banking system. In terms of the implications of economic policies, monetary authorities must enforce and respect the policy of raising the bank minimum capital requirements. They should also encourage banking concentration in Ivory Coast, since the share of the five big banks positively influences credit supply.

Keywords: Capital, credit supply, impact, Cooke ratio, bank capital, bank

Classification J.E.L.:G21; G28

1. Introduction

Since banks contribute to financing the economy, the existence of a healthy and effective bank system is essential in every economy (Northcott, 2012). Nevertheless, financial markets are imperfect markets and the individuals participating in them do not share the same information. Economies' thorough financialisation in the 1980s led to often violent financial crises. Non-compliance to prudential regulation was considered as both a catalyst and amplifying factor of financial crises.

Today, after many financial crises, a real and new consensus emerged about financial regulation. Micro-prudential regulation having shown its limits, macro-prudential regulation now has to be prioritized. Besides, substantial research efforts are committed to help the elaboration of macro-prudential policies (Galati and Moessner (2013)). One micro-prudential tool remains bank minimum capital requirement. Indeed, the higher a bank's equity, the more solid the bank is, thereby fostering the stability of the bank system. However, the bank can also discourage loan supply by internalising the potential social cost of credit default; this could be done by an increase of lending rates caused by high costs of equity (Morrison and White (2005), Adrian and Shin (2010), Shleifer and Vishny (2010), Adrian and Boyarchenko (2012), Jeanne and Korinek (2013), Malherbe (2015)). In fact, the tax benefits of debt financing and the asymmetric information at the level of the bank imply that increasing external equity financing can be costlier for banks than debt financing (Tirole (2006), Hanson and al. 2011), Gornall and Strebulaev (2013)). Beyond the constraints related to the supply of banking products, to credit requests and to the instruments of monetary policies, compliance to regulatory norms could lead to resource scarcity which, in turn, is likely to discourage bank credit supply.

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Indeed, the rules promulgated by the Basel Committee are based on the principle that every increase of the volume of credit is followed by needs of bank equity which could constrain banks in their activity of credit distribution. Hence, given the possibility of credit constraints following the implementation of the Basel II Accord, several studies were conducted in order to appreciate the scope of these measures. At the empirical level, numerous authors contributed through their studies namely, Pazarbasioglu (1997) on Finland, Ghosh and Ghosh (1999) on East Asia, Konishi and Yasuda (2004) on Japan, Chiuri et al. (2002) on 16 emerging countries, Dionne and Harchaoui (2003) on Canada, Van Roy (2003) on the G-10 countries, Barajas, Steiner and Cosimano (2005) on Latin America, Berger and Udell (1994) and Peek and Rosengren (2000) on the United States. Despite this strongly documented empirical literature, the debate remains on the likely effects of bank minimum capital requirements on credit distribution.

In 2007, the authorities of the West African Economic and Monetary Union (WAEMU) decided to raise the minimum share capital applicable to banks and financial establishments in the Union to ten billions and three billions, respectively. This decision comes within the context of promoting a sound and solid financial and banking system likely to effectively contribute to financing the Union's economic development. It is also justified by the necessity of revising the former capital norm, which is fifteen years old while the economic and financial environment as well as the operating conditions has highly developed. A strong consolidation of WAEMU's banking system is expected from the implementation of the new norm, with namely a sensible enhancement of the regulatory capital and of the overall solvency of credit establishments. In Ivory Coast, the capital adequacy ratio went from 10.05 in 1990 to 7.58 in 2000. On the same period, bank credit to the economy related to GDP went from 14.20 in 1990 to 11.0 in 2000. In 2016, the capital adequacy ratio was at 7.33 while the credit to the economy ratio related to GDP settled at 27.60. From these figures, the influence of minimum capital requirements on credit supply does not clearly appear. Therefore, a central question is raised: to what extent did bank minimum capital requirements affect bank credit supply? Hence, the objective of this study is to analyse the effect of bank capital regulations on loan supply in African economies. Our general objective can be subdivided into specific objectives.

Specific Objective 1: Analysing the effect of raising the level of minimum capital requirements on credit supply in Ivory Coast.
Specific Objective 2: Evaluating the effect of bank size on banks' capacity to supply credit.
In relation with our objectives, we formulate the two following hypotheses.
Hypothesis 1: An increase of bank minimum capital requirements leads to an increase of credit supply in the long run.
Hypothesis 2: An increase of bank size has a positive impact on financing the economy.

At the methodological level, we estimate coefficients by using the Generalised Least Squares (GLS) method on dummy variables (LSDV). This study contributes to the empirical literature on the relation between bank regulations and credit distribution in Ivory Coast on the 2004-2015 period. The results obtained from this study are the following. Increasing capital requirements is favourable to credit supply in Ivory Coast. The market share of the five big banks has a positive impact on bank credit supply. However, increasing bank size is not favourable to bank credit supply. Section 3 will present the methodology of the study. Section 4 will be about the empirical results, particularly the econometric analysis of the relationship between bank minimum capital requirements and bank credit supply. Section 5 is dedicated to the conclusion.

2. Literature Review

This section revisits the theoretical and empirical literature on the relationship between bank capital requirements and bank credit supply. However, before that, we examine the determinants of credit supply.

2.1. Literature Review on the Determinants of Credit Supply

Economic growth and financial deepening explain the credit supply provided by foreign banks in the countries of Central and Eastern Europe (Burcu Aydın, 2008). By studying the determinants of loan supply to the private sector in the Euro Zone, Calza and Sousa (2001) show that loans are positively correlated with real GDP and negatively correlated with long-term and short-term interest rates. In a recent study, Guo and Stepanyan (2011) show that credit growth is associated to the dynamism of the national economy. A strong economic growth leads to credit increase while higher inflation reduces credit supply.

From a sample of 26 Pakistani commercial banks on the 2001-2010 period, Hussain and Junaid (2012) found that GDP growth, the development of the industrial sector, bank solidity, bank size, exchange rate depreciation and budget deficit have a significant and positive impact on bank credit supply. Still in Pakistan, Imran and Nishat (2013), on the period from 1971 to 2008, using time series based on the econometric approach (ARDL), show that external debt, national deposits, economic growth, the exchange rate and monetary conditions have important repercussions on bank credit supply to the private sector in Pakistan, particularly in the long run.

2.2. Literature Review of the Relationship between Bank Capital Requirements and Credit Supply

At the theoretical level, bank minimum capital requirements are justified. Indeed, on the one hand, banks have to comply with the international norms of return on equity demanded by stakeholders; on the other hand, international prudential norms compel banks to a strict capital coverage of their risks (Plihon, Couppey-Soubeyran, Saïdane, 2006). The micro-economic implications derived are also numerous. Generally, banks are required to take decisions on the amount of capital they should hold for three reasons. Firstly, capital is used to avoid bank failure. This is a situation in which a bank cannot fulfil the reimbursement obligations towards its depositors and other creditors and where it bankrupts. Hence, a bank holds a capital to reduce the probability of becoming insolvent. Second of all, the amount of capital affects the performance of bank owners. Indeed, due to the performance coefficient, the weaker the bank capital, the higher owners' profitability. As a result, bank owners might not want their bank to hold too much capital. Thirdly, a minimum capital amount is imposed by the regulator. Considering that holding a capital engenders high costs, bank managers often wish to have less than the minimum capital imposed by regulation authorities in comparison with their assets. In that case, the amount of capital is determined by capital requirements.

In terms of macro-economic implications, bank capital requirements affect financial stability by reducing ex-ante banks' tendency to take risks and ex-post, by allowing banks to amortize bank losses. By means of a theoretical model, Martines-Miera and Suarez (2014) show that the bank chooses its systemic risk exposure by deciding between the gains derived from risk taking and the preservation of its capital value. Thus, capital requirements can reduce risk taking and decrease both the cost and frequency of systemic crises. Nevertheless, capital requirements can exacerbate banks' risk taking. With the new funds obtained, banks can invest in speculative and risky activities (Martynova et al. 2015). By using a CAPM model, Miles et al. (2012) conclude that a strongly capitalised bank reduces the possibility of bank risks. In a sample made of emerging and developing countries, De Haan and Klomp (2015) show that capital requirements reduce the risk of bank assets. In contrast, on a sample of more than 3,000 banks of 86 countries, Demirguc-Kunt and Detragiache (2011) observe that bank capital regulation is not significantly associated to bank risk, measured by banks' Z-scores.

The link between bank capitalisation and banks' capacity to give loans was also strongly documented. Some articles examined the theoretical foundation of capital regulation and its potential effects on credit expansion. The theoretical foundations of this argument are shown in the study of Bernanke and Gertler (1995). Banks' inability to comply with the requirement of capital increase leads them to reduce credit supply (Myers and Majluf, 1984). By using cross-sectional data, Bernanke and Lown (1991) show that the increase of loans between 1990 and 1991 was positively correlated with the level of banks' capital. By using a sample of 16 emerging countries, Chiuri et al. (2002) show that the introduction of higher bank capital requirements could induce a decline of bank credit supply. On German data, on the 1965-2009 period, Buch and Prieto (2014) find that a one percent (1%) increase of bank capital is associated to a 0.23% increase of bank loans. Nevertheless, bank loans only decrease with bank capital when the capital related to assets ratio exceeds 33%. Albertazzi and Marchetti (2010), on Italian data, from 2007-2009 show that contraction of bank credit is associated to weak bank capital.

Nonetheless, Barrios and Blanco (2003), using the data of Spanish commercial banks between 1985 and 1991, notice that banks were not compelled by capital regulation during the period of study. Beatty and Gron (2001) find similar results using the data of 438 American listed holdings between 1986 and 1995. Barajas et al. (2005) analyse the impact of Basel I on credit downturn in Latin America and they do not arrive at a clear conclusion. Holmstrom and Tirole (1997) show that the capital ratio behaves in a pro-cyclic manner, increasing during expansion and decreasing during contraction. There is a close relationship between bank assets and liabilities (Diamond and Rajan (2000)). Deposits increase during expansion, in parallel with the expansion of bank credit, leading to an increase of the solvency ratio.

3. Strategy of the Empirical Research and Data Description

In this section, we present the model specification and research methodology.

3.1. Model Specification

Under the econometric form, the regression model is as follows:

$$LAR_{it} = \alpha_{it} + \beta_1 \text{CAR}_{it} + \beta_2 \text{ROA}_{it} + \beta_3 \text{CR5}_{it} + \beta_4 \text{BANKSIZE}_{it} + \beta_5 \text{CAR} * \text{CREDITRISK}_{it} + \varepsilon_{it} \quad (1)$$

Where LAR represents credit supply. It is the ratioof the annual amount of credit granted by the bank ito the total amounts of all bank assets in Ivory Coast. The variable$CAR$is the regulatory capital. It is the ratio of the annual amount of the bank i's regulatory capital to the total amounts of the bank's assets.The variable$ROA$is the return on assets. It is the ratio of the annual amount of the bank i's net income to the total amounts of the bank's assets. The$CR5$variable is the market share of the 5 biggest banks. It is the ratio of the annual amount of credit granted by the bank i to the total amounts of all bank credits. The variable$BANKSIZE$ measures the size of the bank. It is obtained from the logarithm of total asset. The logarithm of total asset allows to reduce the amplitude of big companies and to reduce the heteroscedasticity (Titman and Wessels (1988)). The variable$CREDITRISK$expresses the credit risk inherent to the bank. It is the volume of provisions for the bank's non-performing loans related to the bank's total assets.

3.2. The Panel Estimation

Our study is done with the help of panel data, regarding their twofold dimensions, namely an individual dimension and a temporal dimension. From this characteristic, the panel data are thus particularly suitable if one desires to estimate models and test the theories underlying those models (Nerlove et Balestra, 1995). Hence, this model (1) can be once again specified in the following way:

$$LAR_{it} = \alpha_{it} + \beta_1 \text{CAR}_{it} + \beta_2 \text{ROA}_{it} + \beta_3 \text{CR5}_{it} + \beta_4 \text{BANKSIZE}_{it} + \beta_5 \text{CAR} * \text{CREDITRISK}_{it} + \varepsilon_{it} \quad (2)$$

With $i = 1, \ldots\ldots\ldots 5, t = 1, \ldots\ldots 12$; X_{1it} , the value of the $j-th$ variable forthe $i-th$ unit atthe $t, j = 1, \ldots\ldots 5$period. Kisthe number of explanatory variables in the model andα_{it}, β_i, are the coefficients of the exogenous variables for the individual i.Lastly, $\varepsilon_{it}$is the term of errors for the individual $i$at the$t$ date.

This model assumes that each individual has a specific behaviour, the behaviour being different from one period to another. Devoid of any economic interest, this model becomes interesting once identifying restrictions are imposed to it, the restrictions corresponding to different hypotheses one desired to test. The economic literature more often retains three hypotheses that we present in the context of our study.

First, the homogenous model. This type of model assumes the presence of a uniform behaviour between individuals. The estimation of this model is done by simply applying the ordinary least squares (OLS) on all the data connected with paying attention neither to their peculiar nature nor to the nature of the ε_{it}hazard. In this model, all coefficients are identical. In that case, one can write:

$$H1: \begin{cases} \alpha_{it} = \alpha \\ \beta_{kit} = \beta_k \end{cases} etH2: \ \mu_{it} = iiN(0, \sigma^2)$$

This brings our model to be given by:

$$LAR_{it} = \alpha + \beta_1 \text{CAR}_{it} + \beta_2 \text{ROA}_{it} + \beta_3 \text{CR5}_{it} + \beta_4 \text{BANKSIZE}_{it} + \beta_5 \text{CAR} * \text{CREDITRISK}_{it} + \mu_{it} \quad (3)$$

If one assumes the existence of a difference of behaviours between individuals, then this model is no longer suitable. Next, the individual effect which assumes that individual estimations only differ in their constant. In that case, we make the distinction between the fixed effect model where the individual effect is constant throughout the time, and the random effect model where the constant term is a random variable. Concerning the fixed effect model, it takes into account the heterogeneity of the behaviours of the individuals making up the sample. This is done by considering that the equations regulating the relationships of the variable explained and the explanatory variables stand out from one individual to the other through a constant. Hence, the estimation method of the parameters depends on the structure of the error terms. If the errors are homoscedastic, non-auto-correlated in the temporal dimension and in the individual dimension, one uses the OLS method on the dummy variable (LSDV) or on the Within estimators. In the case where the systematic effects are represented by the intercepts αi for each individual, one can write the hypotheses in the following way.

$$H1: \begin{cases} \alpha_{it} = \alpha_i \\ \beta_{kit} = \beta_k \end{cases} etH2: \ \mu_{it} = iiN(0, \sigma^2)$$

The equation is given by:

$$LAR_{it} = \alpha_i + \beta_1 \text{CAR}_{it} + \beta_2 \text{ROA}_{it} + \beta_3 \text{CR5}_{it} + \beta_4 \text{BANKSIZE}_{it} + \beta_5 \text{CAR} * \text{CREDITRISK}_{it} + \mu_{it} \ (4)$$

In the absence of a structural specificity of the endogenous variable that differ according to individuals, it is possible to retain another hypothesis: the random effect hypothesis. The random effect model assumes that the relationship between the variable to be explained and the explanatory variables is no longer fixed but random. The individual effect (constant) is no longer a fixed parameter but a random one. This model can be written in the following way:

$$H1: \begin{cases} \alpha_{it} = \alpha \\ \beta_{kit} = \beta_k \end{cases} etH2: \ \mu_{it} = \alpha_i + \varepsilon_{it}$$

The equation is given once again by:

$$LAR_{it} = \alpha + \beta_1 \text{CAR}_{it} + \beta_2 \text{ROA}_{it} + \beta_3 \text{CR5}_{it} + \beta_4 \text{BANKSIZE}_{it} + \beta_5 \text{CAR} * \text{CREDITRISK}_{it} + \mu_{it} \ (5)$$

With : $\mu_{it} = \alpha_i + \varepsilon_{it}$

The Hausman Test is a specification test which allows to determine whether the coefficients of the two estimations (fixed and random) are statistically different. The statistic of this test is a Chi-square test at a $k$degree of freedom. If the test probability is below 5%, then the Within estimators are unbiased. In the contrary, we will retain the GLS models or the random effect model.

3.3. Stationary and Co-integration Test

The robustness of results depends on adherence to the series' stochastic characteristics. To this end, stationarity tests should be applied as well as the co-integration test, where appropriate. There is stationarity of variables if the characteristics (expectation and variance) are not found to be modified over time. It is difficult, and even impossible, to clearly identify the stochastic characteristics of a series if it is not stationary. In a panel, the most common test to analyse the stationarity of variables is the test of Im-Pesaran and Shin (2003) and of Levin Lin and Chu (2002). As for the co-integration test, it allows to identify the genuine relationship between two variables by looking for the existence of a vector of co-integration and by eliminating its effect, if need be. Co-integration tests allow to detect the presence of a long-term relationship between variables. Yet, it is quite interesting to know the short- and mid-term evolution of this relationship. If series are co-integrated, then the relationship should be estimated through an error-correction model. In our study, co-integration tests were not applied because our series are all stationary in level.

3.4. Data and Descriptive Statistics

In this sub-section, we first of all present the data source and secondly, the different statisticalcharacteristics of the variables in our study. Our study will be carried out from a panel of fourteen (14) Ivorian banks on the 2004-2015 period and the choice of this period is relevant to the availability of data. The study data mainly come from the Central Bank of West African States (BCEAO). They are either extracted from the various annual or quarterly reports (2003-2016) of the WAEMU Banking Commission, or the BCEAO database located in its website (www.bceao.int). Table 2 below gives us the statistical description of the variables used for our study.

Table 1: Description of Variables

Variables	Observations	Mean	Std. Deviation	Minimum	Maximum
LAR	168	91.71741	162.6903	0	1,312.953
CAR	168	11.54969	21.05844	1.096531	179.0564
ROA	168	2.206584	21.51603	-20.54919	257.5826
CR5	168	85.30917	5.49426	77.58	96.06
BANKSIZE	168	5.122427	0.5261368	3.672375	6.056017
CREDITRISK	168	1.07626	1.844595	0	15.60706

Source: Authors from the BCEAO database (2015)

The analysis of the table below shows the dynamics of the regulatory capital on the 2004-2015 period. On the period examined, in average, the regulatory capital is at 11.55% against a maximum of 179.06% and a standard deviation of 21.06%, expressing its successive variations.

In average, the bank's return on assets is 2.21% against a maximum of 257.58% with a minimum of -20.55% and a standard deviation of 21.52%. This expresses the oligopolistic nature of the banking landscape in Ivory Coast. Indeed, only few banks hold on their own a great proportion of clients. The market share of the 5 biggest banks is high, with a mean of 85.31%, at only less than 10.75% to the maximum which is at 96.06%. This minimum market share of the 5 biggest bank is big, 77.58%, confirming the oligopolistic nature of the banking landscape in Ivory Coast. The average size of banks is 5.12% for a maximum of 6.05% of all the banks' total asset against a minimum of 6.06%, which expresses a relative homogeneity in the assets held by banks in Ivory Coast. In Ivory Coast, the credit risk inherent to the bank is 1.08% in average against a maximum of 15.61%.This illustrates that very few banks run major risks concerning their clients' default probability.

4. Results of the Empirical Research

The purpose of this section will be to present the results of the different econometric tests, as well as the estimates of our model, then their statistical and economic interpretations.

4.1. Results of the Stationarity and Co-integration Tests

There are many tests to assess variables stationarity on panel data (Levin Lin and Chu (2002)), IPS(2003). In this study, we use the Fisher-type test of Im-Pesaran and Sim(2003) and of Madala and Wu(1999). Our test results are summarised in the table below.

Table 2: Results of the Stationarity Test

Variables	IPS (2003)	MW (1999)	F-type		Decision
			ADF	PP	
LAR	-3.2187 (0.0006*)	59.0623 (0.0005*)	131.1496 (0.0000*)	131.1496 (0.0000*)	I(0)
CAR	-2.5409 (0.0055*)	56.4879 (0.0011*)	128.5752 (0.0000*)	128.5752 (0.000*)	I(0)
ROA	-4.6897 (0.0000*)	141.6749 (0.0000*)	141.6749 (0,0000*)	141.6749 (0.0000*)	I(0)
CR5	-3.1143 (0.0009*)	48.3854 (0.0097*)	48.3854 (0,0097*)	48.3854 (0.0097*)	I(0)
BANKSIZE	0.5975 (0.7249)	62.0130 (0.0000*)	62.0130 (0,00002*)	62.0130 (0.00002*)	I(0)
CREDIT-K	-2.874 (0.0022*)	132.5156 (0.0000*)	132.5156 (0.0000*)	132.5156 (0.0000*)	I(0)

Note: The values with * stand for the rejection of H0 at 1%
Source: Author compilation

The analysis of this table highlights that all variables are stationary in level. We can now estimate the parameters of the model.

4.2. Specification Tests of Individual Effects

To bring out the indirect relationship between the regulatory capital and credit supply, we first estimate the following model:

$$LAR_{it} = \alpha_{0i} + \beta_1 \mathrm{CAR}_{it} + \beta_2 \mathrm{ROA}_{it} + \beta_3 \mathrm{CR5}_{it} + \beta_4 \mathrm{BANKSIZE}_{it} + \varepsilon_{it} \quad (6)$$

We first of all test the homogenous or heterogeneous specification of the data-generating process. It is about testing the equality of the model's coefficients in the individual dimension. This amounts to determining from the specification tests, whether one can assume that the theoretical model studied is perfectly identical for all individuals. In the first place, we posit the uniformity hypothesis of the credit supply behaviours. The estimates are presented in the table below.

Table 3: Estimates of the Homogenous-Model Test

Exogenous Variables	Coefficients	Student Statistic	p-value
CAR	0.9685896	1.41	0.160
ROA	0.0251173	0.04	0.966
CR5	1.732734	0.77	0.444
BANKSIZE	-45.0227	-1.63	0.105
CONS	163.2824	0.67	0.507

Source: Author compilation

The Fisher test shows that the test is globally significant ($\text{Prob} > F = 0.0426$). Concerning the adjustment quality, the model explains around 5.84% of the total variance ($R - squared = 0.0584$).Given that the probability of the Fisher test is lower than the critical threshold, the homogenous structure is rejected. However, there might be bank specificities that will lead to a significant influence on their level of credit supply. Taking these effects into account leads us to estimate another model called the fixed effect model. Table 4 shows the results of the individual effects test.

Table 4: Results of the Individual Effects Test

Exogenous Variables	Coefficients	Student Statistic	p-value
CAR	-0.7605269	-1.03	0.302
ROA	-0.660491	-1.08	0.284
CR5	1.442885	0.69	0.491
BANKSIZE	-295.5822	-5.72	0.000
CONS	1492.965	4.57	0.000
	$\text{F test that all } \mu_i = 0 : \text{F}(13, 150) = 3.13 \text{ Prob} > F = 0.0000$		

Source: Author compilation

The p-value associated to the test statistic is lower than 5%. In fact, one has: $\text{F test that all } \mu_i = 0 : \text{F}(13, 150) = 3.13 \text{ Prob} > F = 0.0000$. The result is that there are enough statistical evidences for the heterogeneity hypothesis between the coefficients of different banks. The fixed effects introduced are thus significant. One cannot reject the null hypothesis of specific effects absence at the 5% threshold. In that case, the model to be estimated is called a panel heterogeneous test. Hence, we include individual effects to our panel data model. But this specific effect can be individual or random. One should therefore have a second specification test to decide whether the specific effects have a random nature. The most widespread test to solve such problems is the Hausman test. We use the Lagrange multiplier to choose the compound error model. The null hypothesis of the test is that the variance between individuals is equal to zero. (The test p-value is Prob> chibar2 =1). We accept the null hypothesis here, which brings us to conclude that the random effect coefficients of the model are not effective. Now, we are undergoing the Hausman test in order to discriminate between fixed effects and random effects. The results of the Hausmantest are as contained in Table 5.

Table5:Results of the Hausman Test

Exogenous Variables	Coefficients		Difference (b-B)	Std.Deviation
	Random (b)	Fixed (B)		
CAR	-0,7605269	0.9685896	-1,729116	0,2624684
ROA	-0,660491	0,251173	-0,6856084	0,1919549
CR5	1,442885	1,732734	-0,2898495	-
BANKSIZE	-2955822	-45,0227	-250,5595	43,74935
$\mathbf{chi2(4) = (b - B)'[(V\_b - V\_B)^{-1}](b - B) = 37,55}$ $\mathbf{Prob > } chi2 = 0.0000$				

Source: Author's compilation

The Hausma test allows to discriminate between the fixed effects and the random effects models. It relies on the following hypotheses. Here, the fixed effects are effective, the p-value is:$\text{Prob} > chi2 = 0.0000$.

The Wooldridge test to detect the autocorrelation in the panel data revealed an autocorrelation of the first order (F(1,13) = 44, 299 Prob>F=0.0000). This p-value is below the 5% threshold. This brings us to use the Generalised Least Squares (GLS). After doing all these tests, we conclude that the model to be retained for the analysis and interpretation of coefficients is the GLS model with error correction and heteroscedasticity.

4.3. Analysis and Interpretation of Results

Here, we proceed the estimates analyses and interpretations of the simple model and the model with interaction. The estimates obtained through the GLS method are summarised in the table below. This Table 7 presents two models according to whether the capital requirements have a direct or indirect effect on bank loans in Cote d'Ivoire. Model I estimates the direct effect of capital requirements on bank loans in Cote d'Ivoire. The variables "market share of the 5 biggest banks" and "bank size" are significant at the 1% threshold. However, if the "market share of the 5 biggest banks" positively influences bank loans, it is quite the contrary for "bank size". The variable "regulatory capital" is also significant at the 5% threshold and positively influences credit supply. In contrast, the variable "return on asset of the bank" does not influence credit supply. Some banks also influence credit supply through their specificities. In fact, the dummy variable IBANK3 is significant at 1% and negatively influences credit supply.

Model II estimates the indirect effect of capital requirements on bank loans. All variables are significant. The variables "bank size", "regulatory capital", "return on asset of the bank" and "credit risk inherent to the bank" are significant at the 1% threshold. However, apart from the variable "credit risk inherent to the bank", all other variables negatively influence bank loans.

The variable "market share of the 5 biggest banks" is also significant at the 5% threshold and positively influences credit supply. Some banks also influence credit supply through their specificities. In fact, the dummy variable IBANK3 is significant at 1% and negatively influences credit supply.

Table 6: Estimates

Endogenous Variables (LAR)	Model I			Model II		
Exogenous Variables	Coefficients	Std.Dev.	p-value	Coefficients	Std.Dev.	p-value
CAR	1.736495	0.7567594	0.022**	-1.398319	-0.4746733	0.003*
ROA	-0.4099728	0.3483314	0.239	-2.312798	0.3800119	0.000*
CR5	0.8958556	0.3120724	0.004*	0.4882975	0.2296155	0.033**
BANKSIZE	-67.35522	19.46338	0.001*	-52.22583	10.09181	0.000*
CAR*CREDITRISK	-	-	-	0.8943396	0.1100106	0.000*
IBANK2	-24.94854	26.56096	0.348	-13.09923	15.18258	0.388
IBANK3	-74.97549	19.0492	0,000*	-41.3201	10.28032	0.000*
IBANK4	29.12882	36.8045	0.429	43.5603	34.56033	0.208
CONS	360.627	107.6287	0.001*	309.6115	55.25925	0.000*

Note: values with (*),(**) represent the respective levels of significance at 1% and 5%.
Source: Author from the data of BCEAO (2016)

Three major results are to be interpreted. The first result is that capital increase is not detrimental to credit supply. In Ivory Coast, bank credit depends more on fundamental macro-economic principles than on the regulatory constraints of the financial system. This result confirms the former empirical studies of Ben Naceur and Kandil (2013) who studied the direct link between the application of Basel I and bank loans. Just as we did it, they found that the application of Basel I does not contribute to reducing credit supply. Indeed, on the period of study, credits progressed rapidly, favoured by an accommodating monetary policy in the zone (reduction of BCEAO's prime rate from 4.25% to 3.50% since 2009, of the minimum reserves coefficient from 7% to 5% and of the prudential transformation ratio from 75% to 50%) and by the dynamism of the economic activity (growth higher than 8% since 2012). However, capital increase negatively impacts credit supply through bank risk. This result means that when banks' capital increases and they integrate credit risk, they tend to forsake the less risky traditional bank's intermediation activity for the benefit of investments in the riskier international financial market. The economic theory confirms this result.

Indeed, Koehn and Santomero (1980) showed that a tightening of capital constraints does not necessarily lead to a reduction of the bankruptcy probability, and this because of the resulting portfolio reallocation. In fact, it is costly for a bank to raise its capital. Hence, compelling a bank to increase its capital reduces the expected profitability. In return, the bank invests in riskier assets to have higher profitability. The default probability can become higher in that case. Koehn and Santomero (1980) therefore suggested that such a regulation should take into account the composition of both the asset and capital. The second major result is that bank size negatively influences credit supply. The increase of bank assets is often associated to the development of off-balance activities. Hence, banks abandon the traditional intermediation for the benefit of new activities in order to become financial corporations. This attitude of banks leads to a dwindling of credit supply to the economy. Degryse and Ongena (2012) rightly showed that in difficult times, banks rely on securitisation and this reduces their ability to grant loans to the economy. However, the economic theory in its whole agrees on the fact that these credit derivatives enhance banks' loan supply (Hirtle, 2009). The third major result of this study is that the market share of the five biggest banks of Ivory Coast has an effect on credit supply. Indeed, the increase of the five biggest banks' market share has a positive impact on credit supply. When banks' market share increases, they have a consistent number of clients. In order to satisfy those increasingly demanding clients, those banks go as far as increasing bank credits to maintain and win over more clients.

5. Concluding Remarks

In this study, our objective was to examine the effect of banks' capital minimum requirements on credit supply in Ivory Coast on the period from 2004 to 2015. The study is done on fourteen Ivorian banks. Our study is motivated by the importance of compliance to prudential norms in the stability and solidity of the bank system. At the methodological level, we use the Generalised Least Squares (GLS) method. The study results in important results. The increase of capital requirements is favourable to credit supply in Ivory Coast. However, this effect is frustrated by banking risk. The study also notes that the increase of bank size is detrimental to bank credit supply. Furthermore, the market share of the five biggest banks positively influences the credit supply of the banks in our sample.

In sum, these results provide a given number of implications in terms of policies. First, the policy of banks' capital raise in Africa must be pursued. Moreover, a highly capitalized bank allows banks to resist some shocks. Secondly, a policy aiming at increasing banks' market share is favourable to credit supply to the economy in Ivory Coast.

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