

# Banks' Balance Sheets and Monetary Policy Transmission Mechanism of BEAC

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## ABSTRACT

The aim of this paper is to evaluate the effect of banks' balance sheets characteristics on the monetary policy transmission mechanism in Cameroon. To conduct our study, we focus our attention on bank credit channel. The data used in this research work are collected from National Credit Council (CNC) within the period 2006-2016. The estimation of our model by the Dynamic Ordinary Least Square (DOLS) and Fully Modify Ordinary Least Square (FMOLS) methods led to the following results: credit channel is at work in Cameroon; moreover, the result reveals that banks with big size, strong liquidity and highly capitalized are less responsive to restrictive monetary policy than banks with small size, less liquidity and less capitalized. These results reveal that banks' balance sheets characteristics negatively affect the monetary policy transmission mechanism in Cameroon. We therefore recommend to the monetary authorities to take into consideration the differential level of banks' balance sheets characteristics when implementing a monetary policy decision.

**Keywords:** Bank balance sheet, Credit channel, DOLS, FMOLS, Monetary policy, BEAC.

**JEL Classification:** E50; E51; E52; E58.

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### **Highlights of this paper:**

- This paper use individuals data of commercials banks to identify the lending channel of monetary policy transmission in Cameroon.
- The study employs econometrics tools like FMOLS and DOLS and find hat, banks' balance sheets characteristics negatively affect the monetary policy transmission mechanism in Cameroon through lending channel.
- This paper also shows that, banks' heterogeneity lead to an asymmetric response of banks to monetary policy innovations.

## **1. INTRODUCTION**

Monetary policy is one of the main tools of conjunctural economic policy. Its implementation is done through the manipulation of monetary policy instruments such as interest rates, exchange rate, open market operations and obligatory reserves. This should in fine have repercussions on the supply of credit, inflation and growth while improving the welfare of the population. The success of such operation is strongly linked to the control of the channels by which the impulses of monetary policy are transmitted from the monetary sphere to the real sphere (Kashyap & Stein, 1995). However, the analysis of stylized facts in Cameroon raise some doubts about the functioning of the monetary policy transmission mechanisms of the Bank of Central African States (BEAC).

Indeed, in Cameroon which is a country member of the Economic Community of Central African States (CEMAC), we register a decreasing evolution of BEAC's main interest rate. The Interest Rate on Tenders (TIAO) decreased from 8.4% in 1994 to 6.5% in 2002; then it fall to 2.45% in 2016 (Credit National Council of Cameroon, 2016). This downward trend in the TIAO would have lead to an increase in the supply of bank credit (Jiménez, Ongena, Peydró, & Saurina, 2008). Paradoxically, the evolution of growth rate of the supply of bank credit in Cameroon does not verify this logic of the credit channel. The growth rate of gross credit declined from 28.71% in 2002 to 15.15% in 2016 (Credit National Council Report of Cameroon, 2016). Over the same period, for a TIAO decline of around 62.08% the real GDP growth rate rised from 4.01% to only 4.5% (World Bank, 2016). This set of facts raises questions about the effect of the TIAO on the supply of credit and consequently the transmission of monetary policy in Cameroon. Another highlight is that the Cameroonian banking system over the same period is concentrated, liquid and there is a growing trend of bank capital justified by banking regulations (Credit National Council Report of Cameroon, 2016). However, according to Van Den Heuvel (2002b); Kashyap and Stein (1995) liquidity and bank capital are resilience factors of the banking system to monetary policy innovations. Therefore, one wonders if this context does not contribute to reduce the responsiveness of the bank credit supply to monetary policy shocks.

The CEMAC banking sector alone holds about 85% of the financial assets and liabilities of the Central African Monetary Union (UMAC), thus becoming the main source of finance to the economy of the area (Bikai & Kenkouo, 2015). Theoretically, countries with large banking systems are generally propitious to the emergence of the credit channel (Mohanty & Turner, 2008). In such an environment, the modification of a monetary policy decision goes through the banking channel to affect the real sphere of the economy (Mohanty & Turner, 2008). Therefore, the success of such an operation depends on the sensitivity of commercial banks to changes in monetary policy decisions. Due to the preponderance of the banking sector in the CEMAC financial system, the credit channel appears to be the main transmission mechanism of BEAC's monetary policy.

There is ample literature on the issue that focuses on bank lending as a monetary policy transmission mechanism. In fact, the credit channel highlights the effect of monetary authority's actions on credit supply. His analysis highlights the role of banks in the transmission of monetary policy. Since Bernanke and Blinder (1988)

developed the founding model of the credit channel, a debate has begun on the effect of a monetary policy decision on the credit supply.

According to [Bernanke and Blinder \(1988\)](#) a reduction of bank reserves leads to a contraction of credit supply under the assumption of double dependence. However, [Romer \(1989\)](#) argue that, in the case of restrictive monetary shock, banks can raise funds by issuing deposit certificates to maintain the growth of their credit portfolio. This weakens the bank credit channel. On the other hand, [Stiglitz and Weiss \(1981\)](#) show that, in the presence of asymmetric information between lenders and borrowers, changes in bank lending rates do not permit an efficient clearance of the credit market. In such a situation, credit rationing is the only optimal response to the changes in interest rate. This will lead to a decrease in demand through the decline in investment.

The first empirical study that verified the existence of the bank lending channel is based on aggregate data ([Bernanke & Blinder, 1992](#)). In the CEMAC zone, for example, some authors have focused their attention on the issue of the monetary policy transmission of BEAC's ([Beguy, 2012](#); [Saxegaard, 2006](#)). The common point of these works is that, these authors make a macroeconomic analysis of the monetary policy transmission by considering each country in the CEMAC zone as a bank. This way of testing the credit channel poses a serious problem of identification. According to [Nasha and Dulani \(2015\)](#) a macroeconomic analysis of the transmission mechanisms does not allow to separate the variation in bank lending explained by the interest rate channel from that explained by lending channel. In doing so, these authors neglect the specificities specific to the behavior of each bank. However, the heterogeneity of bank balance sheets provides an additional argument for improving the understanding of the transmission of monetary policy ([Kashyap & Stein, 1995](#)). In this respect, [Brissimis and Delis \(2009\)](#) perceive bank liquidity, size and bank capital as factors internal to the bank that influence the response of bank credit supply to monetary policy shocks.

This study differs from the work already done in the CEMAC zone by taking into account the heterogeneity of bank balance sheets in the analysis of the bank lending channel. It is therefore necessary to answer the following central question: what is the effect of bank balance sheets on the transmission of BEAC's monetary policy? In other words, what is the effect of the TIAO on the bank credit supply through bank balance sheets? The aim of this paper is to evaluate the effect of bank balance sheets on the transmission of BEAC's monetary policy. The rest of this paper is organized into 5 sections. Section (2) present some stylized facts. Section (3) is devoted to the presentation of the literature review. Section (4) describes the methodology used to conduct the empirical analysis. The results of the successful conclusion of the econometric approach are presented and discussed in section (5). We will end with the conclusion.

## **2. STYLIZED FACTS**

This section presents some indicators on the effectiveness of monetary policy and bank balance sheets in CEMAC zone.

### *2.1. Indicators of The Effectiveness of Monetary Policy*

In order to assess the effectiveness of BEAC's monetary policy, a comparative analysis is made between the evolution of GDP and inflation in terms of objective and achievement in the CEMAC zone. The [Table 1](#) presents this situation.

Table-1. Evolution of BEAC's objectives and achievements.

Years	Growth rate			Inflation rate
	Expected (a)	obtained(b)	(a)-(b)	
2002	6,5	4,2	2,3	3
2003	4	4,1	-0,1	1,3
2004	7,9	6,9	1	0,4
2005				2,9
2006	4,3	3,1	1,2	5,2
2007	5	4	1	1,6
2008	5,8	4,4	1,4	5,9
2009	2,8	3,2	-0,4	4,3
2010	4,8	4	0,8	1,6
2011	5,2	5,1	0,1	2,7

In the CEMAC zone, the inflation rate must be at most equal to 3% according to the convergence criteria. If we look at the data in the table above, we can see that, the rate of inflation in the CEMAC zone has often exceeded the threshold of 3%, particularly in 2006, 2008 and 2009. In Guinea, for example, the rate of inflation remained well above the cut-off except in 2007 where the rate was 2.8%. With regard to the growth rate, it appears that CEMAC achieved the projected rates only 3 times out of 10 periods between 2002-2011. These push us to question the credibility of BEAC's monetary policy. This last statement can be verified toward the analysis of the evolution of banking activity indicators in the CEMAC area.

## 2.2. Evolution of Bank's Balance Sheet Indicators in Cameroon and CEMAC Zone

In this sub-section, we present the indicators that can be used to appreciate the state of the banking system in CEMAC zone in general and in Cameroon in particular. We are talking about bank liquidity, the size of bank balance sheets, deposits and loans, profitability, and the quality of the credit portfolio.

### 2.2.1. Evolution of Bank Liquidity

Most of the indicators for assessing the level of liquidity show that, there is a bank excess liquidity in the CEMAC area. Table 2 below give some figures on the evolution of banking liquidity in the CEMAC zone.

Table-2. Evolution of banking liquidity indicators in CEMAC zone.

Years	Obligatory reserve (in million of FCFA)	Free or surplus reserves (a)			Total reserve (in million of FCFA) (b)	Ratio (a)/(b) (%)
		(in million of FCFA)	Growth rate (%)	rate		
2001	38073	392715	-		430788	91,16
2002	62312	310163	-21,02		372475	83,27
2003	118386	300057	-3,26		418443	71,71
2004	139316	247909	-17,37		387225	64,02
2005	174680	653154	163,47		827834	78,10
2006	226279	842135	28,93		1068414	78,82
2007	372342	1015301	20,56		1387643	73,17
2008	517893	1097538	8,10		1615431	67,94
2009	570187	1168493	6,46		1738680	67,21
2010	651286	1441956	23,40		2093242	68,90
2011	835067	1648438	14,32		2483505	66,40
2012	943 885	2 485 951	50,8		3429836	72,48
2013	1 050 700	1 755 900	-29,36		2806600	62,56
2014	1 114 996	2 432 110	38,5		3547106	68,56

This table reveals that, despite the downward trend ratio of free reserves in total reserves, its value is above 50% from 2001 to 2014. This shows that the measures taken by the public authorities and the monetary authorities to reduce excess bank liquidity are not efficient.

2.2.2. Size of Bank Balance Sheets in Cameroon and in CEMAC Zone

The observation of Figure 1 below makes us understand that the banking activity measured by the total assets of banks' balance sheets is in expansion in CEMAC zone and in Cameroon.

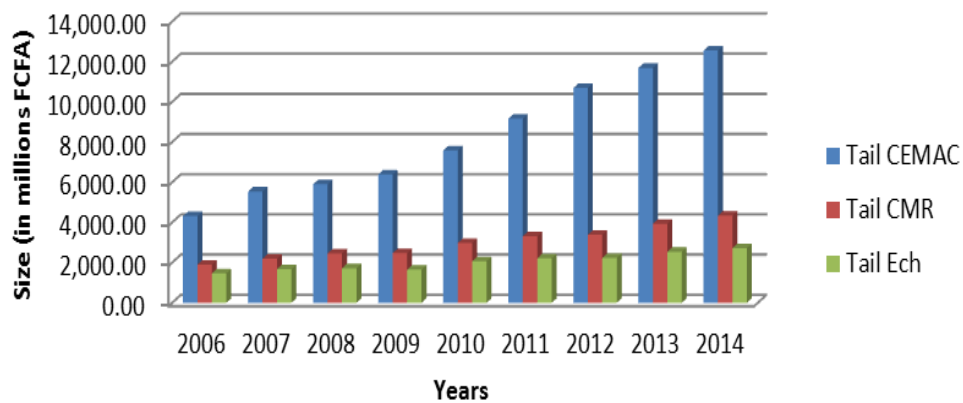


Figure-1. Evolution of the banks' balance sheets size in CMR and CEMAC zone.

The variable Tail representing the size of the banks is measured by the total assets of banks' balance sheets; CMR represent Cameroon and Tail Ech the samples size.

2.2.3. Evolution of Deposits And Loans

The Figure 2 below shows the evolution of the deposits and credits of the sample considered in this work. Our sample size is 6 commercial banks taken in Cameroon. We can see that deposits and credits are on an upward trend.

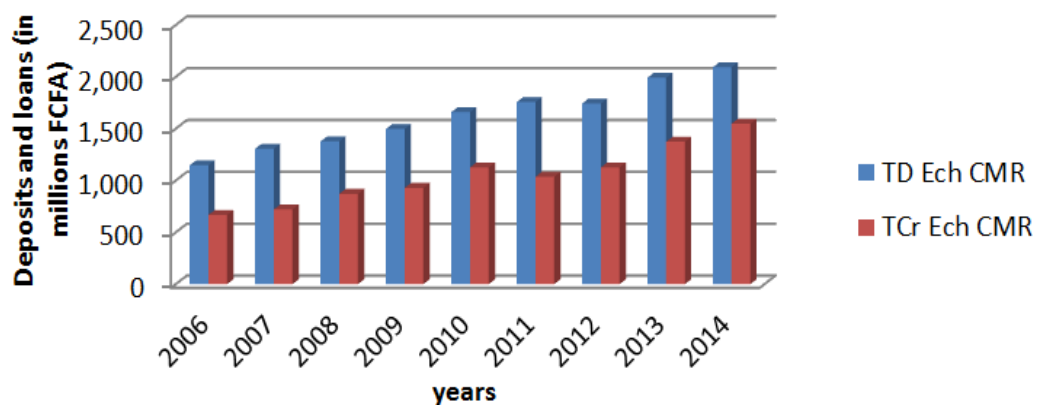


Figure-2. Evolution of deposits and credits in Cameroon.

The Figure 2 above shows that the volume of deposits is greater than the volume of credits granted each year. The difference between deposits and credits is greeter than obligatory reserves. This explains the presence of abundant liquidity in Cameroon.

2.2.4. Evolution of the Coefficients of Profitability in Cameroon and CEMAC Zone

In addition, the Table 3 below shows that the coefficients of profitability recorded in the CEMAC zone are positives, except that of 2009 in Cameroon. Thanks to these figures, we can say that the banking system of CEMAC is globally profitable.

Table-3. Evolution of the Banking profitability coefficients.

Years	2006	2007	2008	2009	2010	2011	2012	2013	2014
CR (CEMAC) ( % )	15,4	27,2	23,3	7,9	10,5	12,3	14,5	19,8	13,5
CR (CMR) ( % )	15,3	14,1	12,9	-4,5	6,2	4,1	11,6	18,9	13,4

Note: CR represents the Coefficient of Profitability.

2.2.5. Evolution of Banks' Capital Stock

The Figure 3 below shows that, the social capital of Cameroon's banks is increasing within the period 2006-2014.

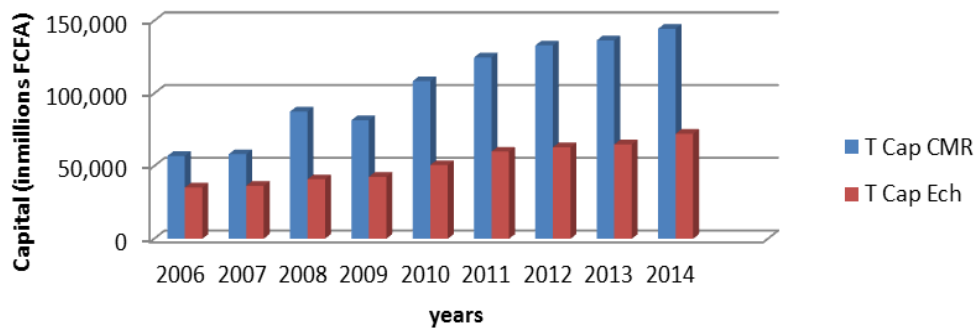


Figure-3. Evolution of the social capital of banks in Cameroon.

Note: T cap represents the total of the social capital, CMR Cameroon and Ech is sample.

This upward trend finds explanations in the capital regulation. According to regulation COBAC R-2009/01 / fixing the minimum capital of credit institutions, banking institutions with their headquarters in the territory of the CEMAC must have at least 10 billion FCFA. To respect this rule, banks had to raise their capital to at least 5 billion at the end of June 2010, 7.5 billion at the end of June 2012 and at least 10 billion at the end of June 2014. Out of 13 commercial banks operating in Cameroon in 2014 only two banks did not cross the threshold of 10 billion FCFA at the cut-off date. Five constituted exactly the volume required and 6 constituted a capital stock higher than the required minimum. This heterogeneity of banking behavior can also be observed on the market share of banks operating in Cameroon.

3. CRITICAL REVIEW OF THE LITERATURE

The purpose of this section is to present the literature review that highlight the construction of the research question. Thus, the presentation of the theoretical framework will make it possible to better understand the empirical verifications.

3.1. Theoretical Review of the Literature

Theoretical debates on monetary policy revolve around the influence of money on economic activity. The works of Frieman and Schwartz (1963) confirm the dominant role of money in the cyclical variations of production and inflation. However, the literature on the transmission mechanisms of monetary policy has shown that this transmission varies from one monetary zone to another, between countries in the same monetary zone and between

commercial banks according to the characteristics of their balance sheets (Holmstrom & Tirole, 1997; Kashyap. & Stein, 1994; Khemraj, 2008; Noyer, 2007). The effectiveness of monetary policy is therefore affected.

The action of the monetary authorities on the real activity is transmitted by channels which can be grouped in four categories: the interest rates channel, the price of the other assets channel, exchange and the bank lending channel. In the case of the CEMAC economies, the first three channels react only slightly to the actions of the monetary authorities because of the practice of a fixed exchange rate and the absence of a real financial market (Saxegaard, 2006). Due to the preponderance of the banking system in the CEMAC financial system, the bank credit channel (lending channel) seems to be the best mode of the monetary policy transmission of BEAC. This verifies the first existence condition of the credit channel as described by Bernanke and Blinder (1988). According to him, for the credit channel to be operational, the bank credit supply must be the main source of financing for the economy. In addition, the Central Bank must be able to influence the credit supply plan of commercial banks. This second condition is questionable from the microeconomic point of view (Kashyap & Stein, 1995). Because, the heterogeneity of the endowment of banks in terms of liquidity and capital can to a certain extent constitute a factor of bank resilience to monetary policy shocks.

According to Mishkin (1996) the credit channel highlights the effect of monetary authorities' actions on credit supply. Therefore, a better transmission of monetary policy depends on the degree of responsiveness of the bank credit supply to changes in the monetary policy interest rate. In fact, the debate is not at that level. A certain category of authors finds that the effect of the interest rate on the supply of credit is not without clash. This link can be influenced by both bank size, bank liquidity and bank capital (Gambacorta & Mistrulli, 2005; Kashyap & Stein, 1995; Kashyap. & Stein, 2000). This way of appreciating the bank credit channel finds explanations in the theory of the bank capital channel developed by (Van Den Heuvel, 2002a).

Van Den Heuvel (2002a); Van Den Heuvel (2002b) presents the importance of banks' capital in the bank credit channel. According to him, banks facing an imperfect capital market, can not easily issue new shares. After an increase in interest rates, fewer bank loans can be renegotiated, compared with deposits. Banks must therefore bear a cost in a context where their profits decrease, this prevents the accumulation of capital and forces them to reduce their loans because they are forced to follow the regulation. In addition, when capital is low, due to loan losses or other adverse shock, the bank will reduce its lending to meet the limit capital requirement fixing by prudential authority. Even when the capital requirement is not mandatory, it turns out that the small capital bank may give up profitable loan opportunities in order to reduce the risk of capital shortfall in the future. This dislike of the least capitalized banks explains their high sensitivity to monetary policy shocks compared to the most capitalized banks.

On the other hand, the most capitalized banks can use their excess capital and their external financing capacity to cover their balance sheets against monetary policy decisions. In doing so, they become less sensitive to restrictive monetary policy shocks than weakly capitalized banks, leading to an asymmetry in banks' response to monetary policy change. This analysis reveals an inverse relationship between bank capital and the transmission of monetary policy through bank credit.

It has been known.

### *3.2. Bank Balance Sheets and the Transmission of Monetary Policy: Review of Empirical Work*

There are several empirical studies on the effects of bank balance sheet characteristics on the monetary policy transmission. Kashyap and Stein (1995) are the pioneers. These authors tested the assumption of asymmetry in the response of bank credit supply to monetary shocks, depending on the size of banks in the US. For this purpose, they use a dynamic panel econometric model in which banks constitute individuals. They take into account the



asymmetry of monetary policy transmission between banks according to their size by introducing into the model a multiplicative variable. This variable is the product between the monetary policy variable (Fed interest rate) and the size of each bank. The result show that smaller banks respond more closely to restrictive monetary policy change than large banks.

In their future work, [Kashyap. and Stein \(2000\)](#) make some adjustments to the previous works by substituting bank liquidity to size of commercial banks. Using data from the United States within the period 1976-1993, they estimate in first difference a fixed effect model in dynamic panels. They conclude that the effect of monetary policy on credit is greater in low liquidity banks. As a result of this study, several works will have the same connotation, especially in America, Europe, Asia and Africa.

[Ehrmann, Gambacorta, Martinez-Pages, P., and Worms \(2001\)](#) proposed to analyze the role of banks in the monetary policy transmission in the EURO zone. They rely on the work of [Kashyap and Stein \(1995\)](#); [Kashyap. and Stein \(2000\)](#) with the difference that they take into account bank capital as an additional argument for the transmission of monetary policy. To carry out their study, [Ehrmann et al. \(2001\)](#) specify two fixed-effect models, one for the EURO zone and the other for each country in the zone, to take into account the specificities between countries. The estimation of their model was made by the GMMs (General Method of Moment) of Arellano and Bond. Their results on bank liquidity are in agreement with those of [Kashyap. and Stein \(2000\)](#). However, factors such as size and bank capital have no influence on the bank credit adjustment as a result of a change in the Central Bank interest rate. This result contrasts with that of [Kashyap and Stein \(1995\)](#).

In Asia, based on data from 2003 to 2012, [Birendra \(2013\)](#) evaluate the bank credit channel in Nepal. He particularly tests the reaction of the bank credit supply to monetary policy according to the banks balance sheets characteristics. Taking inspiration from the models of [Ehrmann et al. \(2001\)](#) and [Kashyap and Stein \(1995\)](#). he specifies a dynamic panel model. Its sample size is 25 commercial banks. He estimates his model by the GMM method of Arellano and Bond. The empirical results show that bank credit decreases after a monetary restriction. The bank size seems to have a significant impact on the supply of loans in Nepal. Similarly, liquidity in the case of private sector banks plays a significant role in explaining the supply of bank credit in response to a change in monetary policy in Nepal. But, the impact of bank capital on the credit supply is not significant. For the specific cases of Japan, Nepal and Korea, the results of this study are not identical between Asian countries. Going in the same direction, [Sichei \(2005\)](#) used the generalized method of moments (GMM) to estimate the response of South African bank loans to monetary shocks using quarterly data from 1999 to 2004. This study shows that the most capitalized banks appear to be less sensitive to shocks on the Bank Reserve rate in South Africa.

The results of one category of work show that the characteristics of bank balance sheets affect the transmission of monetary policy while others show that they have no effect on it. This is the case of [Birendra \(2013\)](#); [Ehrmann et al. \(2001\)](#) who found that bank capital does not affect the credit channel, respectively in Nepal and Europe. However, in Jamaica, [Urquhart \(2008\)](#) reveals that the credit supply of the most liquid banks is more sensitive to monetary policy than that of the less liquid banks. This result contrasts with that of [Kashyap. and Stein \(2000\)](#). It can be explained by the fact that the most liquid banks can be those that have a strong aversion to liquidity risk.

In summary, this section allowed to present the review of the empirical works. It shows that the difference between the bank balance sheets characteristics can be a source of asymmetry in the monetary policy transmission. However, the results are different from one country to another, and from one monetary zone to another. Although the contribution of different authors is remarkable in explaining the monetary policy transmission mechanism, certain variables as important as the capital, liquidity and size of banks have been omitted. More specifically, taking into account the credit risk makes it possible to demarcate from the existing works.



#### 4. METHODOLOGY

This section describes the methodology used to conduct econometric approach.

##### 4.1. Econometric Model

In order to assess the effect of the characteristics of bank balance sheets on the response of bank credit supply to monetary policy change, many authors (Birendra, 2013; Ehrmann et al., 2001; Kishan & Opiela, 2000; Ouédraogo, 2011) were inspired by the model of Kashyap and Stein (1995); Kashyap. and Stein (2000). For this purpose, we have used an equation for determining the credit supply in which a multiplicative variable between the monetary policy indicator and the characteristic variable of bank balance sheets is introduced. The advantage of such a model is that, it captures the hidden intuition behind a conditional hypothesis (Brambor, Clark, & Golder, 2005). In addition, it provides detailed information on the relationship between a dependent variable and a group of correlated independent variables (Friedrich, 1982). However, the use of this model is not without risk (high values of standard deviations and multicollinearity problem). For this purpose, Friedrich (1982) and Brambor et al. (2005) seem to agree that the consequences of the inclusion of the multiplicative variable are preferable to those of its exclusion. The use of VAR would have required the aggregation of data into two categories: large and small banks. This does not allow to take into account the heterogeneity of banking behavior. The use of disaggregated data in an interactive model makes it possible to overcome this limit.

This study adopts a linear model written as follow:

$$CRED = f(DEP, RC, TIAO, B) \dots\dots\dots(1)$$

The following equation is obtained by turning Equation 1 into econometric model:

$$LOG CRED_{it} = \beta_j LOG CRED_{it-1} + \alpha_j LOG DEP_{it} + \beta_j RC_t + \gamma_j TIAO_t + \theta_j B_{it} * TIAO_t + \mu_i + \varepsilon_{it} \quad (2)$$

$$\text{with } B_{it} = \begin{pmatrix} CAP_{it} \\ LIQ_{it} \\ TAIL_{it} \end{pmatrix} \quad (3)$$

CRED = Bank Credit Supply.

TIAO = Interest rate on tenders representing the monetary policy variable.

RC = Credit Risk.

B\*TIAO = multiplicative variable.

DEP: Bank Deposits.

$\mu_i$  = fixed effects related to banks.

$\varepsilon_{it}$  = random error term.

LOG which precedes variables, represents the neperian logarithm used to solve the scale problem between the variables. The indices I and t represent respectively the bank and the time period.  $i = 1, 2, \dots, 6$  the individuals that are the commercial banks;  $t = 1, 2, \dots, 9$  the period;  $j=1, 2, 3$  the models.  $\theta$  represents the interaction coefficient for capturing the heterogeneity of the credit supply response between banks (Birendra, 2013; Loupias, Savignac, & Sevestre, 2002). B represents the vector of characteristic variables of the balance sheets of the commercial banks (they are respectively TAIL: the size; LIQ: liquidity, CAP: capital).

##### 4.2. Data And Their Sources

Secondary data are used in this study. They mainly consist of the interest rate on tenders, deposits, credit supply, credit risk and the characteristics of bank balance sheets, collected from the CNC (National Credit Council) over the period 2006-2016. In addition, the 6 banks in the sample from Cameroon account for 33.95% of the total

assets of all CEMAC banks compared to 77% of all banks in Cameroon in 2006. These proportions will then decline over the years to stand respectively at 21.68% and 62.74% in 2014. This decline can be explained by the development of banking intermediation in other countries of the zone and the emergence of new banks.

4.3. Estimation Procedure

A series of preliminary tests is performed to ensure the validity of the results of this study. Fisher's test shows that the panel is heterogeneous. Such an outcome attests to the heterogeneity of banks endowment in capital, size and liquidity. Thus, if there are specificities specific to each bank in the sample, we can say that they will not react the same to monetary policy change. Under these conditions, we adopted the disaggregated data approach, because it takes into account the heterogeneity of bank balance sheets. The stationnarity test of IPS shows that all variables are integrated of order 1. This leads to verify the existence of a long-run relationship between them. Kao's cointegration test led to acceptance of the alternative hypothesis of cointegration. The Breusch-Pagan test shows the presence of heteroscedasticity. Given the results of these preliminary tests and the size of the panel (N less than T), we choose two estimation methods: Fully Modified Ordinary least Square (FMOLS) and Dynamic Ordinary least Square (DOLS). FMOLS automatically correct autocorrelation, heteroskedasticity and endogeneity problems. In practice, they are unbiased when the individual dimension is less than the temporal dimension in a homogeneous panel. Kao and Chiang (2000) performed a comparative analysis of the estimators obtained by the FMOLS and the DOLS, in order to test their robustness in homogeneous and heterogeneous panel. From the Monté Carlo simulations, they showed that the DOLS are more efficient than the dynamic panel FMOLS, whether in the case of an homogeneous or heterogeneous panel, both in large samples and small samples. Therefore, these two estimation methods are used for robustness purposes. In addition, the Wald test makes it possible to say that the three models (relating to size, capital and liquidity) are globally significant. This result is confirmed by the evaluation of the coefficient of determination.

5. RESULTS AND ECONOMIC INTERPRETATION

Table 4 below gives the results of the estimates obtained by the DOLS and FMOLS methods.

Table-4. Estimations results of the models with capital, size and liquidity.

Variables	Modèl 1		Modèl 2		Modèl 3	
	DOLS	FMOLS	DOLS	FMOLS	DOLS	FMOLS
LOGCRED(-1)	0.063508 (0.056330)	0.060241*** (0.022214)	0.048106 (0.031740)	0.038799** (0.018101)	0.000406 (0.015885)	0.140286*** (0.018949)
LOGDEP	0.537207*** (0.042964)	0.538627*** (0.015916)	0.541964*** (0.019428)	0.543206*** (0.011098)	0.496010*** (0.008001)	0.547294*** (0.017260)
INF	1.900708 (9.132238)	5.158587 (4.574906)	0.450514 (5.624428)	1.398570 (2.854547)	3.150485 (3.489348)	2.470279 (0.325615)
RC	-0.175154 (0.268122)	-0.177357 (0.132521)	-0.122468 (0.201036)	-0.119504 (0.098181)	-0.034841 (0.036893)	-0.311886 (0.129880)
TIAO	-7.35536*** (1.903417)	-7.25646*** (0.956645)	-3.38711*** (0.623138)	-3.43837*** (0.299759)	-8.295963** (3.411602)	-12.88243** (4.877638)
TIAO*LOGCAP	5.278119*** (1.223479)	5.150701*** (0.611638)				
TIAO*LOGTAIL			6.252800*** (1.117204)	6.366927*** (0.545902)		
TIAO*LOGLIQ					1.349370** (0.513359)	21.43801** (8.398282)
R-squared	0.827728	0.831985	0.788043	0.798919	0.898274	0.809888
Adjusted R-squared	0.821036	0.833245	0.768418	0.802643	0.897575	0.811557

Note: The values into brackets are standard deviations. \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% respectively.

Like Kashyap and Stein (1995); Kashyap and Stein (2000); Ehrmann et al. (2001); Birendra (2013) the bank lending channel will be operational in Cameroon if the interest rate coefficient is negative and significant. The coefficient of the interaction variable between the monetary policy and the characteristic variables of the bank balance sheets will make it possible to evaluate the effect of the characteristics of the bank balance sheets on the supply of credit. This coefficient is expected to be positive and significant.

### *5.1. Interpretation of the Results of Model 1 Relating to Bank Capital*

The first general observation from Table 4 above is that the TIAO coefficient is negative and significant. It means that the interest rate negatively and significantly affects the credit supply in Cameroon. This can be explained by the fact that an increase in BEAC's interest rate in the context of a restrictive monetary policy leads to an increase in the cost of refinancing of commercial banks. As a result, they will reduce their credit supply. This shows that the credit channel is operational or existing in Cameroon. This result is in agreement with the theory and corroborates with that of Bikai and Kenkouo (2015) and Takoulac, Avom, Ndeffo, and Mouchili (2020).

In addition, the coefficient of the model 1 multiplicative variable (TIAO \* LOGCAP) is positive and significant. This means that the most capitalized banks are less sensitive to the restrictive monetary policy shocks than the less capitalized banks. It means that, when the TIAO increases, most capitalized banks can use their excess capital to isolate their balance sheet from this change and the lending channel become ineffective. In addition, this restrictive monetary policy will largely affect banks that have a low level of capital, because they do not have the same capacity as the big banks to find external financing. Also, the interbank market considered the low capitalized banks as the most riskier banks. Therefore, it becomes difficult to them to find the additional resources. Moreover, the CEMAC financial market is still embryonic and struggling to take off. This allows us to conclude in the asymmetrical transmission of monetary policy by Cameroonian banks according to their level of capital. This result is in agreement with that of Altunbaş, Fazylov, and Molyneux (2002); Ouédraogo (2011). Concerning the credit risk, it has a negative coefficient. This means that an increase in credit risk will lead to a decrease in the supply of credit. But, its impact is not significant.

### *5.2. Interpretation of the Results of Model 2 and 3 Relating to Size and Liquidity*

For model 2, the multiplicative variable coefficient (TIAO \* LOGTAIL) has a positive and significant sign. This means that the effect of an increase in the TIAO on the bank credit supply decreases with the increase in the size of the bank. This sign meets expectations and is consistent with the results of Kashyap and Stein (1995); Kashyap.. and Stein (2000). An attempt to explain this result allow us to say that, when a Central Bank put in place a restrictive monetary policy by increasing his interest rate, big size banks which are generally the branch of multinational firms, will use their excess reserves and external financing capacity to cover their balance sheet to change in Central Bank interest rate. Thus, in short term, they will not be affected by the monetary policy decision. However, small banks do not enjoy these assets and will be significantly affected by the restrictive monetary policy through a sharp reduction in the supply of credit. So, we can say that banks differentially react to monetary policy change according to their size. This result goes in the same direction as that found in the case of model 1 on bank capital.

Concerning model 3, we found that, multiplicative variable has a positive and significant coefficient. According to the literature review, this reveal that, the most liquid banks are less sensitive to monetary policy shocks than the less liquid banks. This is because the more liquid banks with large excess reserves can protect themselves against these restrictive monetary policy shocks. The less liquid ones to avoid the risk of illiquidity will simply reduce their

credit supply. This last result is in agreement with that of Ehrmann et al. (2001); Loupias et al. (2002) and Birendra (2013) Therefore, relating to this third model, it can be said that the situation of bank excess liquidity in Cameroon reduces the sensitivity of commercial banks to monetary policy shocks and thus, weaken the BEAC's monetary policy transmission mechanisms, especially a bank lending channel.

As far as credit risk is concerned, a negative coefficient is recorded. This means that an increase in credit risk leads to a decrease in the supply of credit. This result is explained by the fact that, commercial banks hardly trust in customers when the bank's outstanding debts increase. Therefore, their risk aversion will increase. According to Minsky (1977) an increase in debtors for whom it has become difficult or impossible to fulfill their financial commitments will incite banks to increase their stringency against new loan demand and reduce the banking financing. This result perfectly describes the macroeconomic framework of the Cameroonian economy, characterized by a business climate that is not conducive to the provision of bank credit. In such an environment, even an expansionary monetary policy will not encourage commercial banks to lend. This reduces the effectiveness of the credit channel.

## 6. CONCLUSION AND RECOMMENDATIONS

The objective of this paper was to evaluate the effect of the characteristics of banks' balance sheets on the monetary policy transmission of BEAC. To achieve this goal, we used the individual data of banks within the period 2006-2016. Then we apply the FMOLS and DOLS estimators to our panel data model. The interpretation of the coefficients of the multiplicative variables introduced in each of the three models allows us to verify and validate the central hypothesis. Thus, five main results stem from this study: firstly, the bank credit channel exists in Cameroon; secondly, credit risk negatively affects the bank credit supply in Cameroon, but its impact is not significant; thirdly, the less capitalized banks are better able to transmit monetary policy than the more capitalized banks; fourthly, smaller banks are more likely to transmit monetary policy than large banks; lastly, the less liquid banks are better able to transmit monetary policy than the more liquid banks. These results reveal that, there is an inverse relationship between the characteristics of bank balance sheets and the transmission of monetary policy. Moreover, we are tempted to say that, there is an asymmetry transmission of monetary policy of BEAC due to the heterogeneity of banks balance sheets. This reduces the effectiveness of monetary policy. We therefore recommended that, monetary authorities should take into account the differential level of banks' balance sheets while implementing a monetary policy decision. In addition, the BEAC should define a regulation that balances the level of banks balance sheets characteristics between banks. This will encourage banks to have the same behavior following a monetary policy decision.

## REFERENCES

- Altunbaş, Y., Fazylov, O., & Molyneux, P. (2002). Evidence on the bank lending channel in Europe. *Journal of Banking & Finance*, 26(11), 2093-2110. Available at: [https://doi.org/10.1016/s0378-4266\(02\)00201-7](https://doi.org/10.1016/s0378-4266(02)00201-7).
- Beguy, O. (2012). *Three essays on excess liquidity in the central African economic and monetary community (CEMAC)*. New Regime Thesis, University of Auvergne Clermont-Ferrand I.
- Bernanke, B., & Blinder, A. (1988). Credit, money and aggregate demand. *American Economic Review*, 78(2), 435-439.
- Bernanke, B., & Blinder, A. (1992). The federal funds rate and the channels of monetary policy transmission. *American Economic Review*, 82(4), 910-921.
- Bikai, J., & Kenkouo, G. (2015). Analysis and evaluation of monetary policy transmission channels in CEMAC: An SVAR and SPVAR approach. *BEAC Working Paper, No.15 (02)*.

- Birendra, B. (2013). The bank lending channel of monetary policy in Nepal: Evidence from bank level data. *Nepal Rastra Bank Working Paper*, 25(2), 43-65.
- Brambor, T., Clark, W. R., & Golder, M. (2005). *Understanding interaction models: Improving empirical analyses*. Oxford University Press.
- Brissimis, S., & Delis, M. D. (2009). Identification of a loan supply function: A cross-country test for the existence of a bank lending channel. *Journal of International Financial Markets, Institutions and Money*, 19(2), 321–335. Available at: <https://doi.org/10.1016/j.intfin.2008.01.004>.
- Credit National Council of Cameroon. (2016). Annual report on money, credit and the functioning of the banking and financial system.
- Ehrmann, M., Gambacorta, L., Martinez-Pages, J., P., S., & Worms, A. (2001). Financial systems and the role of banks in monetary policy transmission in the Euro area. *ECB Working Paper*, No. (105).
- Friedrich, R. J. (1982). In defence of multiplicative terms in multiple regression equations. *American Journal of Political Science*, 26(4), 797-833. Available at: <https://doi.org/10.2307/2110973>.
- Frieman, M., & Schwartz, A. (1963). A monetary history of the United States (pp. 1867-1960): Princeton University Press.
- Gambacorta, L., & Mistrulli, P. (2005). Bank capital and lending behaviour: Empirical evidence for Italy. *Journal of Financial Intermediation*.
- Holmstrom, B., & Tirole, J. (1997). Financial intermediation, loanable funds, and the real sector. *the Quarterly Journal of economics*, 112(3), 663-691. Available at: <https://doi.org/10.1162/003355397555316>.
- Jiménez, G., Ongena, S., Peydró, J., & Saurina. (2008). Hazardous times for monetary policy: What do twenty-three million bank loans say about the effects of monetary policy on credit risk? *CEPR Discussion Paper No. (651)*.
- Kao, C., & Chiang, M. (2000). On the estimation and inference of a cointegrated regression in panel data. *Advances in Econometrics*, 15, 179-222
- Kashyap, A., & Stein, J. (1995). *The impact of monetary policy on bank balance sheet*. Paper presented at the Carnegie-Rochester Conference Series on Public Policy.
- Kashyap, A. K., & Stein, J. C. (1994). Monetary policy and bank lending monetary policy (pp. 221-261): The University of Chicago Press.
- Kashyap, A. K., & Stein, J. C. (2000). What do a Million observations on banks say about the transmission of monetary policy? *American Economic Review*, 90(3), 407-428. Available at: <https://doi.org/10.1257/aer.90.3.407>.
- Khemraj, T. (2008). Excess liquidity, oligopolistic loan markets and monetary policy in LDCs. *Desa Working Paper*, No. (64).
- Kishan, R. P., & Opiela, T. P. (2000). Bank size, bank capital and the bank lending channel. *Journal of Money, Credit and Banking*, 32(1), 121-141. Available at: <https://doi.org/10.2307/2601095>.
- Loupias, Savignac, & Sevestre. (2002). Is there a bank lending channel in France ? Evidence from bank panel data. *Banque de France Working Paper*, No. (92).
- Minsky, H. (1977). *A theory of systemic fragility*. In Altman and Sametz (Eds.), *Financial Crises: institutions and markets in a fragile environment*. New York: John Wiley and Son.
- Mishkin, F. S. (1996). Monetary transmission channels: Lessons for monetary policy. *NBER Working Paper*, (5464).
- Mohanty, & Turner. (2008). Monetary policy transmission in emerging market economies: What is new? *BIS Working Paper*, 35.
- Nasha, & Dulani. (2015). Monetary policy transmission in emerging Asia: The role of banks and the effect of financial globalization. *IMF Working Papers NO 14/ 207*.
- Noyer, C. (2007). *Financial innovation, monetary policy and financial stability*. Paper presented at the Spring Conference, Banque de France.

- Ouédraogo, S. (2011). *Banks and transmission of monetary policy in the WAEMU: Effects of bank balance sheets, bank concentration and excess bank liquidity on the effectiveness of the BCEAO's monetary policy*. Doctoral Dissertation) University of Auvergne Clermont-Ferrand I.
- Romer, P. (1989). Increasing returns and long-run growth. *Journal of Political Economy*, 94, 1002-1037. Available at: <https://doi.org/10.1086/261420>.
- Saxegaard, M. (2006). Excess liquidity and effectiveness of monetary policy; Evidence from Sub-Saharan Africa (pp. 1-52.): IMF Working Paper No 115.
- Sichei, M. (2005). *Bank-lending channel in South Africa: Bank-level dynamic panel data analysis*. Paper presented at the 10th Conference for the African Econometrics Society held in Nairobi, Kenya.
- Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review*, 71(3), 393-410.
- Takoulac, M., Avom, D., Ndeffo, L. N., & Mouchili, E. (2020). Effect of banking concentration on monetary policy transmission mechanism in Cameroon. *Asian Journal of Economic Modelling*, 8(2), 89-95. Available at: <https://doi.org/10.18488/journal.8.2020.82.89.95>.
- Urquhart. (2008). The reaction of bank lending to monetary policy: The case of Jamaica. *Business, Finance and Economics in Emerging Economies*, 3(2), 59-97.
- Van Den Heuvel, S. (2002a). *Banking conditions and the effects of monetary policy: Evidence from US States*. Mimeo: University of Pennsylvania.
- Van Den Heuvel, S. (2002b). Does bank capital matter for monetary transmission? *Economic Policy Review*, 8(1), 260-265.
- World Bank. (2016). *World development indicators*. Washington DC: World Bank.

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