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# Financial Accelerator and Bank Excess Liquidity in CEMAC Zone

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***Abstract:*** In this paper, we broaden the debate on the determinants of bank excess liquidity by focusing on a new mechanism. Using time series data from six CEMAC countries and using shock simulation in a structural VAR as well as Co-integration analysis in an ARDL model, the empirical analysis shows that the financial rigidity caused by the increase in the information asymmetry premium leads to a fall in investment which weakens economic activity. The fall in economic activity amplifies the increase in information asymmetry premium resulting in an increase of free reserves. Finally when the effect of the financial accelerator is reduced by stretching the information asymmetry premium towards zero, then the refunding policy through calls to tender favors a decrease of interest rates, a profusion of credit and consequently the increase of investments and consumption. We suggest all measures aimed at reducing the asymmetry of information on the credit market, in particular, the creation of credit offices and / or public credit registers, the creation of rating agencies for companies and individuals, improvement of the quality of institutions whose poor quality leads to the camouflage of information and moral hazards.

***Keywords:*** financial accelerator, bank excess liquidity, information asymmetry premium, key interest rates

***JEL classification:*** E6 E30 E32 E44

## 1. Introduction

Over the past 15 years, the economic literature on the determinants of bank excess liquidity has received considerable attention from economists. Most researches focus on the mechanisms leading to bank excess liquidity given its harmful effect on the financing of economy. In a context of under financing of the economy, the excess of free reserves results from the decline in demand for credit. This phenomenon is known as "involuntary excess liquidity" *(Dollar et Hallward-Driemeier, 2000; Berger and al., 2005; Vo Thi,*

Our sincere thanks go to Kenkouo Guy Albert, economist at BEAC, for his participation to the formulation of recommendations in this article.

*2005).* On the other hand, the increase in excess reserves resulting from the voluntary rationing of the credit supply is qualified as voluntary excess liquidity. *(Nissankeand Aryeetey, 1998; Saxegaard, 2006; Wanda, 2007; Houdou et Kamgna, 2008; Fouda, 2009; Gammadigbe and Sodokin, 2013 and Beguy, 2013)*. Though it appears that the increase in the cost of credit linked to the inherent risk justifies the phenomenon of bank excess liquidity, the explanation of the origins of bank excess liquidity remains a challenge for economists.

It emerges from previous developments that very little attention has been paid to the role that the financial accelerator can play in the explanation of bank excess liquidity.The purpose of this article is therefore to show how the financial accelerator mechanism generated by the information asymmetry premium can lead to bank excess liquidity, which in turn makes the BEAC's key interest rate policy to be inoperative. In other words, we will show that in the absence of the principle of the financial accelerator in economies like those of CEMAC, there would be a low level of idle reserve which would imply an effective policy rate.

Facts reveal that the growth level of excessive reserves of banks in the CEMAC zone contrasts with the underfinancing of its economy *(Bikaiand Kenkouo, 2015).* According to the BEAC report (2014), the estimated value of free reserves was FCFA 1999.2 billion in 2013, i.e. 264.48 per cent more than in 2003.

This dizzying growth of gross reserves in banks led the central bank to launch a liquidity reduction operation in the banking system to better contain the risks upon the monetary stability (BEAC, 2014).In addition, BEAC (2020) fears an acceleration in the progression rhythmof bank gross reserves, which stood at 2,220.5 billion in September 2019, thus an increase of 20.3 per cent more than in September 2018.Following the advice of the International Monetary Fund (IMF), the central bank even decided in February 2020 to launch an operation to reduce liquidity in the banking system to "better contain the risks upon the monetary stability". This seems to render the BEAC's key rate policy inoperative, as bank refinancing is gradually diminishing across the entire BEAC issuance area.The refinancing rate fell from 12 per cent in 1990 to less than 3 per cent in 2013. Paradoxically, the Call for Bids Interest Rate (TIAO) fell from 8.4 to 4 per cent between 1994 and 2012, while the Repo Interest Rate (TIPP) rose from 9.75 to 5.75per cent over the same period *(M'bakob and al., 2015)*

According to COBAC (2012), these free reserves are the consequence of the great imbalance between loans and deposits, the latter being 1.66 times greater than loans. *Nissanke and Aryeetey (1998), Saxegaard (2006), Houdouand Kamgna (2008) Gammadigbe and Sodokin (2013) and Beguy* (2013) talk of paradox of bank excess liquidity because most of bank loans intended

to the Small and Medium size Enterprises (SME) range only from 9 to 20 per cent. This indicator of the under financing of the economy is an evocative sign of financial rigidity, a basic concept of theories on the financial accelerator. There are few studies on the financial accelerator in Sub-Saharan Africa. Some existing studies have chosen other sides than the one of CEMAC. We can cite the works of *Fall (2016)* on the West African Economic and Monetary Union (UMEOA), which pays interest on the mechanisms of the financial accelerator, without establishing a link with bank excess liquidity. This article seeks then to fill this gap by using the SVAR (Structural Vector Auto Regressive) modeling. This method enables to simulate the mechanisms tending to those of the financial accelerator, as can be seen in the works of *(Blanchard et Quah, 1989; Bernanke et Blinder, 1992; Ziky, 2005; Iliopulos et Sopraseuth, 2011; Bikai et Kenkouo, 2015)*. After having formulated an equation of the risk premium (equation 6) which makes it possible to identify the one of the information asymmetry premium (equation 7), we construct three empirical models, which are estimated on the basis of quarterly chronological data ranging from 1994 to 2016 country by country. The first model is the empirical model of the financial accelerator which enables the appreciation of the strength of the financial accelerator principle on the evolution of free reserves. The second model highlights the relationship between the banking system and the central bank.This model will enable the appreciation of the effectiveness of the key rates policy in the context of bank excess liquidity amplified by the financial accelerator. The third model highlights the interaction between the financial sphere and the economic sphere in the absence of bank excess liquidity linked to the financial accelerator. In other words, in a context whereby the information asymmetry premium tends towards zero.This will make it possible to simulate the behavior of the CEMAC economic and financial system in a framework where the principle of the financial accelerator would be inoperative and the idle reserves would be low.

The continuity of this article is structured around theliterature review (2), the research methodology (3), the discussion of results (4) and conclusion (5).

## 2. Literature Review

In the economic literature, the debate remains mixed on the voluntary nature or not of banks to accumulate idle reserves in a context of underfinancing of the economy. *Baltensperger (1980)*, *Agénor and al. (2004)* note that the excess of idle reserves results from the involuntary contraction of credit supply by banks, without however highlighting the mechanism of this contraction, which can be statistically verified. *Dollar and Hallward-*

*Driemeier (2000); Berger and al (2005), Vo Thi (2005)* argue that the increase in pricing might be at the origin of bank excess liquidity. For the latter, the increase in bank pricing leads to a decrease in credit demand and therefore to an increase in free reserves. Though relevant, this mechanism doesn't highlight the variable at the origin of this increase. They simply show that the high pricing of banking services results from a strong asymmetry of information which increases the probability of default, which suggests that the variable at the origin of the rise in credit rates is necessarily a risk premium related to information asymmetry problem. To fill this gap, a risk premium model (equation 6) was formulated, whose implication allowed the calculation of the information asymmetry premium.

Most empirical researches on bank excess liquidity draw their foundation from the theory of credit rationing developed by *Stiglitz and Weiss (1981)* and focus on the determinants of bank excess liquidity with the ambition of highlighting the its involuntary nature. This. Excess liquidity can result either from the effects of credit risks, the pricing of banking services, or the regulatory and legal framework.

According to *Berger and al. (2005*), a high pricing is linked to a high information asymmetryand a reluctance of banks to grant credit.In this sense, high pricing is likely to limit loans and lead to bank excess liquidity. *Jappelli and al. (2005)* using panel data from 8 countries, covering the period 1994 to 2004, find that legal efficiency leads banks to lend to small borrowers, once considered to be real risk factors. In such a context, according to them, it is difficult to speak of bank excess liquidity simultaneously associated with underfunding of the economy. *Doumbia (2011*) analyzes the paradox of bank excess liquidity in the UEMOA (West African Economic and Monetary Union) zone. For the latter, the devaluation of the FCFA marks the beginning of bank excess liquidity in the UEMOA zone. Bank excess liquidity would therefore be the consequence of constraints linked to the protection of monetary parity. *Wanda (2007)* relies on a survey of 10 Cameroonian commercial banks to identify, through a regression of panel data over the period 2002 to 2005, the factors of bank excess liquidity. He concludes that in Cameroon bank excess liquidity is mainly explained by the importance of credit risk; the disciplinary nature of the COBAC regulations (Central African Banking Commission); the overpricing of services provided to large companies and the lack of appeal to arbitration as an alternative way of resolving disputes between the bank and its debtors.Credit risk would be the most dominant factor and alone explain 99.99 per cent of the variability of free reserves, which implies that reducing credit risk should be the workhorse of public authorities.

*Beguy (2013)* builds a VAR (Vector Error Regression Model) model that can enable him to assess the origin of bank excess liquidity in the CEMAC zone over the period 1985 to 2002. After estimating his model by the generalized method of moments, he finds that as a precautionary measure, banks voluntarily set a high risk premium in order to ration credit. Out of credit rationing results an increase in free reserves

The mechanisms leading to bank excess liquidity mentioned in most of the previous works remain limiting in that they do not highlight the vicious circle of bank excess liquidity. The vicious circle of bank excess liquidity is a mechanism that shows how bank excess liquidity is formed and then self-feeds with the consequence of rendering the central bank's key rates policy inoperative.this can only be seen by making a connection between the economic dynamism, the credit risk and the bank excess liquidity. The economic theory of the financial accelerator may help to demonstrate such a link empirically. If this mechanism turns out to be statistically significant, it becomes easier to prescribe accurate economic policy measures to the issue of bank excess liquidity in a context of underfunding of the economy, which would be a breakthrough for economics.

The financial accelerator is any mechanism describing how the tightening of financing conditions affects the real variables of the economy which in turn amplify the initial shock *(Iliopulos and Sopraseuth, 2011).*

According to financial accelerator theorists, financial rigidities negatively affect the economic activity which leads to more financial rigidity. *(Bernanke, 1983; Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Bernanke et al, 1999; Curdia and Woodford, 2010; Meh and Moran, 2010; Gertler and Karadi, 2011)*.To our knowledge, taking into account the phenomenon of the financial accelerator in the explanation of bank excess liquidity has not been examined before. In order to provide a contribution on this subject, we use data from CEMAC countries to analyze the link between financial accelerator and bank excess liquidity.Considering the fact that banks consider the business environment in the process of granting loans, then the resort to counterfeit, information camouflage and corruption, aggravates the problem of information asymmetry. This problem is further compounded when economic activity is bleak.

All these conditions being met, the banks would include in the structure of interest rates in addition to the normal risk premium, an "information asymmetry premium" linked to the business climate and to the decline in economic activity. When the business climate is very poor, private sector investments are doubly weakened: on the one hand, by the increase in the information asymmetry premium which increases loan interest rates, and

on the other hand by the decrease in the credit supply *(Bernanke, 1983).*The resulting drop in economic activity leads to further deterioration of the business climate, and therefore to an increase in the level of risk which amplifies the initial shock on investment. This scenario is an example of a financial accelerator mechanism likely to be functional in CEMAC. Indeed, the CEMAC zone (Economic and Monetary Community of Central Africa) is faced with a business climate unfavorable to the granting of loans.

The vicious circle of sharp reduction in the creditoffer that results from the mechanism just described causes the growth of free reserves, hence bank excess liquidity. Concretely, this study aims to highlight the following mechanism: the increase in the information asymmetry premium leads to the decrease in credit supply which causes a decrease in economic activity with the consequence of rising the moral hazard and causing an additional increase in the information asymmetry premium then an additional decrease in creditsupply, with the final consequence of growing free reservesat the end of each cycle.

## 3. Methodology

### *3.1. The Data*

#### *3.1.1. Variables and Data Processing*

This study covers the CEMAC zone, made up of six countries namely: Cameroon, Chad, Congo Brazzaville, Central African Republic, Gabon and Equatorial Guinea. Data for each of these countries are secondary sources, covering the period 1994 to 2016. They are all quarterly time series distributed country by country. Some are sometimes macro-financial while others are macroeconomic. The financial data concern the bank credit to the economy (CREDBANK); long-term bank credit (CREDLT); medium-term bank credit (CREDMT); short-term bank credit (CREDCT); free reserves (RESLI); the real interest rate (TIR); 3 month central bank investment interest rates (TISP); the interest rate on the treasury bill (TBT) and the two main BEAC key rates, namely the Call for Bids Interest Rate (TIAO) and the Repo Interest Rate (TIPP)). Macroeconomic data refer to the real GDP growth rate (TCPIB); investment (INVEST) and consumption (CONSO). All these data come from the databases "Evolution of BEAC interest rates and bank conditions"; The World Bank's "Word Development Indicator" and the "African Development indicator" of the African Development Bank (BAD).

A preliminary treatment on the variables was done after the stationarity test. All the variables which were not stationary according to their orders of integration were differentiated in order to make them stationary. Indeed,

macroeconomic or macro financial modeling within the context of the VAR (Vector Auto regressive Model) requires that the variables be stationary *(Meuriot, 2008).* The tables in appendix 1 give an account of the treatments carried out on the variables country by country. D (k) means that the variable has been differentiated k times to make it stationary while I (k) means that the variable is only stationary at order k, except for I (0) which means that the variable is stationary in level and does not need processing. Theresortto the stationarity test of *Dickey-Fuller Augmenté (1979)* combined with that of *Phillip and Perron (1988)* was essential. Their test models are provided in appendix 2.

### *3.1.2. Calculation of the information asymmetry premium*

In *Bernanke's (1983)* theoretical model, the strength of the financial accelerator depends on the external financing premium that gives rise to it. This premium increases the cost of financing paid by investors. The lower the premium, the smaller the effect of the accelerator. *Berg and al. (2004)* use the rate spread in an empirical model as a proxy for the external financing premium mean while in the rate spread there is necessarily the risk-free rate from which we want to extract in order to leave only the residual of the risk premium linked to the extreme camouflage of information in the bank credit environment. *Dolignon and Roger (2010)* use the risk premium on the bond market to characterize the financial accelerator on the French credit market. This premium is difficult to calculate in the CEMAC context due to the embryonic nature of the financial market.

However, inspired by those researches, we calculate the information asymmetry premium (PASYM) which is a key variable of the principle of the financial accelerator in the CEMAC zone according to the following procedure:

Banks adjudicate between three types of investments: the financing of the economy at Real Interest Rate (TIR), the State financing at Treasury Bill Rate (TBT) and investment at the central bank at the Intereston Investments Rate (TISP). To finance the economy, banks charge a risk premium. To calculate this risk premium, we assume that they will not consider the TBT alone, since the TISP is also a risk-free rate.They will make a weighted average of the two rates. Let $\alpha$ equals to the weighting coefficient of the TBT and $\beta$ equals to the weighting coefficient of the TISP, we also make the assumption that the banks judge that the degree of information asymmetry is higher in a CEMAC context than in a normal business environment, so that $\beta \succ \alpha$ . The weighted average rate considered in the calculation of the global risk premium will be

$$\frac{\alpha}{\alpha+\beta}TBT+\frac{\beta}{\alpha+\beta}TISP \tag{1}$$

the PR risk premium formula is $PR = TIR - Taux \text{ sans risque}$ (2)

the risk-free rate of this arbitrage will be the weighted average rate (1)

(1) in(2), there is

$$PR = TIR-(\frac{\alpha}{\alpha+\beta}TBT+\frac{\beta}{\alpha+\beta}TISP) \tag{3}$$

the reduction of (3) leads to

$$PR=\frac{\alpha}{\alpha+\beta}(TIR-TBT)+\frac{\beta}{\alpha+\beta}(TIR-TISP) \tag{4}$$

We assume that the assignment of coefficients α and β is such as

$$\alpha+\beta=1 \tag{5}$$

(4) becomes

$$PR=\alpha(TIR-TBT)+\beta(TIR-TISP) \tag{6}$$

Implication: In CEMAC milieu, banks integrate two types of risk premium in their interest rates. A normal risk premium $TIR-TBT$ and another risk premium that we call Information Asymmetry Premium

$$PASYM = TIR-TISP \tag{7}$$

### *3.2. Empirical Models*

Several works aiming to model and simulate the scenarios of the behavior of economic agents in a system after a shock, have relied on stochastic inter-temporal general equilibrium models (MEGIS) in order to integrate the criticism of *Lucas (1976)* on the absence of the micro basis of macroeconomic models of the VAR type. As an example, we can quote the works of *Smets and Wouters (2003; 2007); Iacoviello (2005); Brzoza-Brzezina and Kolasa (2013).*These models have come under heavy criticism from *Fall (2016) and Blanchard (2016)*. According to the latter, these models suffer from the arbitrary assignment of values to parameters by calibration, thus stripping off their scientificity. They therefore recommend structural forms of VAR which integrate economic theory into the modeling. We therefore inspire ourselves by the works of *Blanchard (2016)* to model the interaction between the financial sphere and the economic sphere of CEMAC through the structural VAR method.

### *3.2.1. Modeling of the financial accelerator principle in the CEMAC*

The model is made up of five variables namely:the information asymmetry premium (PASYM), credit to economy (CREDBANK), investment (INVEST), GDP growth rate (TCPIB), and free reserves (RESLI). Let $X_t$ the vector of endogenous variables of the system at any t time.

$$X_t = \begin{pmatrix} PASYM \\ CREDBANK \\ INVEST \\ TCPIB \\ RESLI \end{pmatrix} \tag{8}$$

$A(L)$ the delay parameter matrix L; $\mu_t$ the vector of structural hazards not correlated at any t time

$$\mu_t = (\mu_{1_t}, \mu_{2_t}, \mu_{3t}, \mu_{4_t}, \mu_{5_t}) \tag{9}$$

We have to estimate the structural VAR represented as follows :

$$A(L)X_t = \mu_t \tag{10}$$

As we want to calculate the various responses to shock, we mustestimate the average mobile representation of reduced VAR. Thatrepresentationis written

$$X_t = B(L)\varepsilon_t \tag{11}$$

where $B(0)$ is the identified matrix and $\varepsilon$ the vector of innovations.

For the model to be realistic, the innovations should be linear combinations of structural shocks affecting the system. This means we assume that there is a matrix named M of dimension (5, 5) so that:

$$\varepsilon_t = M\mu_t \tag{12}$$

From (5), (6) and (7), we can write:

$$B(L)^{-1}A(L)^{-1} = M \tag{13}$$

Thus, the estimation of the structural form of the model consists of the estimation of the 25 elements of the matrix M. As we have seen above, the majority of authors in their researches about the causes of bank excess liquidity neglect to establish a link between it and economic dynamics. Those who have highlighted the credit risk should however realize that the financial rigidity it implies necessarily affects investments which are themselves a key determinant of economic growth.

Modeling the financial accelerator mechanism, however, allows us to analyze the problem of bank excess liquidity from a broader angle. On this basis, we establish hypotheses whose empirical veracity would be reminiscent of the mechanism described above linking the financial accelerator and bank excess liquidity.

***Hypothesis 1:*** The increase in the information asymmetry premium witnessing a high-risk banking environment leads to the rationing of the credit supply.

The factor mostly mentioned in the literature remains the strong presence of the problem of information asymmetry which increases the credit risk.*(Greuning, and Bratanovic, 2004; Boyd and Nicolo, 2005)*. The associated risk premium here called the information asymmetry premium that cannot grow indefinitely leads to credit rationing according to the thesis of Stiglitz and Weiss, 1981

***Hypothesis 2:*** The increase in the information asymmetry premium combined with the rationing of the credit supply has the effect of reducing investment According to the financial accelerator theory, risk premia are the key elements of financial rigidities that amplify negative investment shocks. (Bernanke, 1983; Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Bernanke *et al.*, 1999). The more information asymmetry there is, the more banks refuse to lend regarding the same theory.

***Hypothesis 3 :*** the fall in GDP caused by the reduction in investment amplifies the rise in the information asymmetry premium.

According to the theory of the financial accelerator, the decline in economic activity as a result of financial rigidities is likely to amplify information asymmetry problems and therefore increase credit risk. *(Bernanke et al., 1999; Curdia and Woodford, 2010)*

***Hypothesis 4 :*** the sharp reduction of credit supply implied by the amplified increase of the information asymmetry premium leads to the increase of free reserves.

The financial accelerator theory demonstrates that the financial accelerator amplifies credit rationing through a vicious cycle, however, most of the literature on the determinants of bank excess liquidity maintains that this reduction in credit supply is at the origin of 99 per cent of free reserves (Wanda, 2007)

### *3.2.2. Measurement of the effectiveness of the key rates policy before mitigation of the financial accelerator mechanism*

In order to reassure ourselves that the principle of the financial accelerator favors and amplifies the problem of bank excess liquidity which in turn makes the key rates policy to be ineffective, we put in relation through the

ARDL model (Auto Regressiv Dynamic Lag), the secondary banks and the central bank by estimating their cointegration . The absence of cointegration means the ineffectiveness of the key rates policy and the simulation of shocks on the key rates policy in our structural VAR model with attenuation of the financial accelerator will allow us to conclude on the effect of this accelerator.

The ARDL model to be estimated is as follows:

$$\Delta \log CREDCT_t = \alpha_8 + \sum_{k=1}^{p} \beta_{8k} \Delta \log CREDCT_{t-k} + \sum_{k-0}^{p} \gamma_{8k} \Delta TIAO_{t-k} + \sum_{k-0}^{p} \theta_{2k} \Delta TIPP_{t-k} + \lambda_{81} \log CREDCT_{t-1} + \lambda_{82} TIAO_{t-1} + \lambda_{83} TIPP_{t-1} + \varepsilon_{8t} \tag{14}$$

$$\Delta \log CREDMT_t = \alpha_9 + \sum_{k=1}^{p} \beta_{9k} \Delta \log CREDMT_{t-k} + \sum_{k-0}^{p} \gamma_{9k} \Delta TIAO_{t-k} + \sum_{k-0}^{p} \theta_{3k} \Delta TIPP_{t-k} + \lambda_{91} \log CREDMT_{t-1} + \lambda_{92} TIAO_{t-1} + \lambda_{93} TIPP_{t-1} + \varepsilon_{9t} \tag{15}$$

$$\Delta \log CREDLT_t = \alpha_{10} + \sum_{k=1}^{p} \beta_{10.k} \Delta \log CREDCT_{t-k} + \sum_{k-0}^{p} \gamma_{10.k} \Delta TIAO_{t-k} + \sum_{k-0}^{p} \theta_{4k} \Delta TIPP_{t-k} + \lambda_{10.1} \log CREDLT_{t-1} + \lambda_{10.2} TIAO_{t-1} + \lambda_{10.3} TIPP_{t-1} + \varepsilon_{10t} \tag{16}$$

Parameters $\lambda_{82}; \lambda_{83}; \lambda_{92}, \lambda_{93}; \lambda_{10.2}; \lambda_{10.3}$ are all supposed to be non-significant to conclude on the absence of a sharp link between secondary banks of the CEMAC and their central bank.

### *3.2.3. Shock simulation of monetary policy in a structural VAR model with attenuated force of the financial accelerator*

By assumption, if we reduce the strength of the financial accelerator, there would be very little bank excess liquidity, the relationship between bank loans and the central bank's key rates would be strong, which would imply an efficiency of monetary policy in the system

To reduce the effect of the financial accelerator, we extract the quarters of the variable called information asymmetry premium to make it tend towards zero. We get a new variable:

$$PASYM^2 = \frac{PASYM}{4} \tag{17}$$

Thus the real interest rate satisfying this condition will be

$$TIR^2 = TIR - \frac{3PASYM}{4} \tag{18}$$

It will therefore be about simulating the Structural VAR form of this following macroeconomic model. Here, investment and consumption are given in percentage of GDP

$$\begin{cases} TIR^2 = \gamma_1 TIAO + \gamma_2 TIPP \\ CREDBANK = -\lambda_1 TIAO - \lambda_2 TIPP \\ CONSO = \beta_1 CREDBANK - \beta_2 TIR^2 \\ INVEST = \alpha_1 CREDBANK - \alpha_2 TIR^2 \\ TCPIB = \pi_1 INVEST + \pi_2 CONSO \end{cases} \tag{19}$$

The above model implies that when banks' free reserves are low due to the weakening of the strength of the financial accelerator, a fall in policy rates should lead to a fall in the real interest rate and a rise in the credit supply. These two factors are expected to promote higher investment and consumption, which in turn will promote economic growth.

## 4. Results and Discussion

### *4.1. Interpretation of Results*

#### *4.1.1. Effect of the financial accelerator on bank excess liquidity*

We analyze the effect of the financial accelerator on bank excess liquidity in accordance with the research hypotheses of the first model. We will appreciate alternately: the response of banks creditsuffer after an increase in the information asymmetry premium; the dynamics of investment after a double shock on the information asymmetry premium and the credit supply; the behavior of the information asymmetry premium after a shock on the GDP growth rate and finally the dynamics of free reserves after a decline in bank credit caused by the system.

*4.1.1.1. Increase of information asymmetry premium and behavior of bank credit:* Almost in all CEMAC countries, the amount of offered bank credit falls after the increase in the information asymmetry premium (Figure 1). The theory of credit rationing can help us understand this. According to the credit rationing theory defended by Stiglitz and Weiss (1981), interest rates in an environment of information asymmetry increase at decreasing rates to a saturation threshold, an optimum point. They call it the rationing point.

They call this point, rationing point. This is the interest rate at which banks can no longer tolerate an additional supply of credit and prefer to

ration. We have shown that the information asymmetry premium (equation 6 and 7) is part of the global risk premium which is a component of the interest rate. The increase in the information asymmetry premium in the CEMAC zone might be the factor that pushes the interest rate to the saturation point, resulting in the rationing of credit.

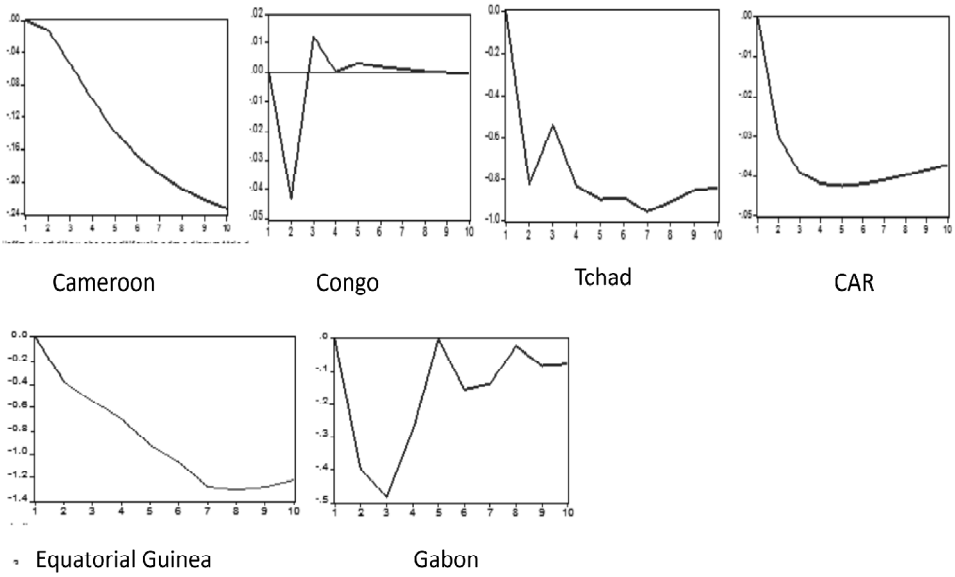


**Figure 1: response of bank credit supply to the shock on the information asymmetry premium**

*Source:* authors

*4.1.1.2. Effect on investment of a double shock on credit supply and on the information asymmetry premium:* Apart from Chad, the increase of information asymmetry premium and the decrease of the credit supply sharply reduce investment with delay. In Cameroon, Congo, CAR and Gabon, the delay is of two periods while in Equatorial Guinea, the delay is of three periods. This means that Chad would depend more on bank credit than any other country, and that Guinea would depend on it less.

Keynes's (1936) investment theory, formulated mathematically by Hicks (1937), makes it possible to explain the behavior of investment in our model. According to the theory,investment is negatively correlated with the interest rate. The interest rate contains the information asymmetry premium in its structure

The increase of information asymmetry premium causes the the interest rate to rise,thus affecting investment.

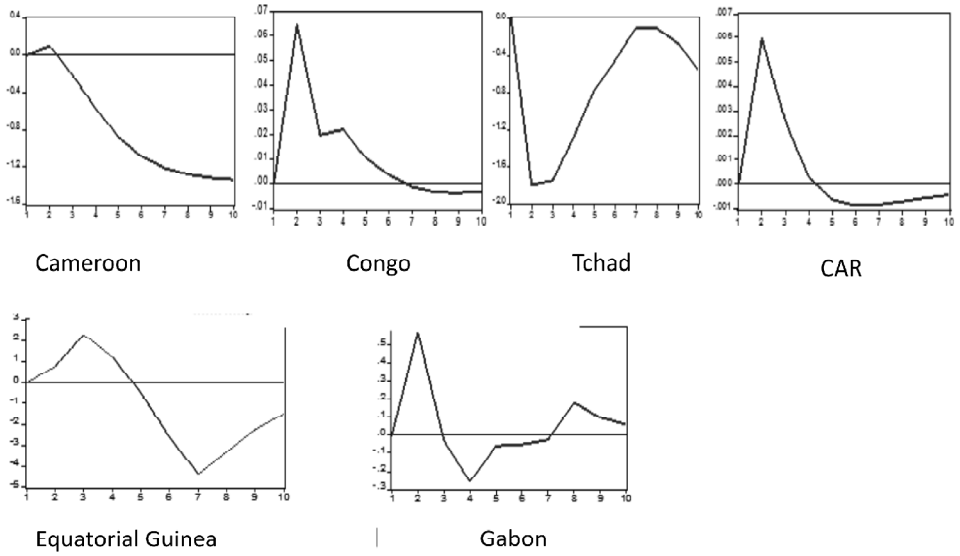


**Figure 2: Response of investment to shocks on the information asymmetry premium and on the supply of credit**

*Source:* authors

*4.1.1.3. The behavior of the information asymmetry premium after a decline in the GDP growth rate:* The GDP growth rate has been used to capture the level of economic activity a low level of economic activity generates an increase of the information asymmetry premium in all countries. Except Cameroun and Chad where the reactions are spontaneous, the information asymmetry premium reacts with delay in other countries, commonly after an average of three periods. According to *M'bakoband Tchounga (2020),*the degradation in economic activity observed by the fall in GDP has a depressive effect on economic agents. The latter seeking to survive and maintain their living standards are likely to degrade the quality of institutions through corruption, which no longer gives credence to the guarantees offered by borrowers.The information on guarantees being unreliable and their realization being likely to cause lengthy legal procedures, bankers fear to borrow.Moreover, the borrowers are more prone to moral hazard. All these factors have caused the increase of the information asymmetry premium depending of the level of economic activity.

*4.1.1.4. Dynamics of free reserves after the degradation of the system (decline in credit, increase in the information asymmetry premium and decline in economic activity):* We could not capture the dynamics of free reserves for the Central African Republic (CAR) due to insufficient data for this country. Cameroon

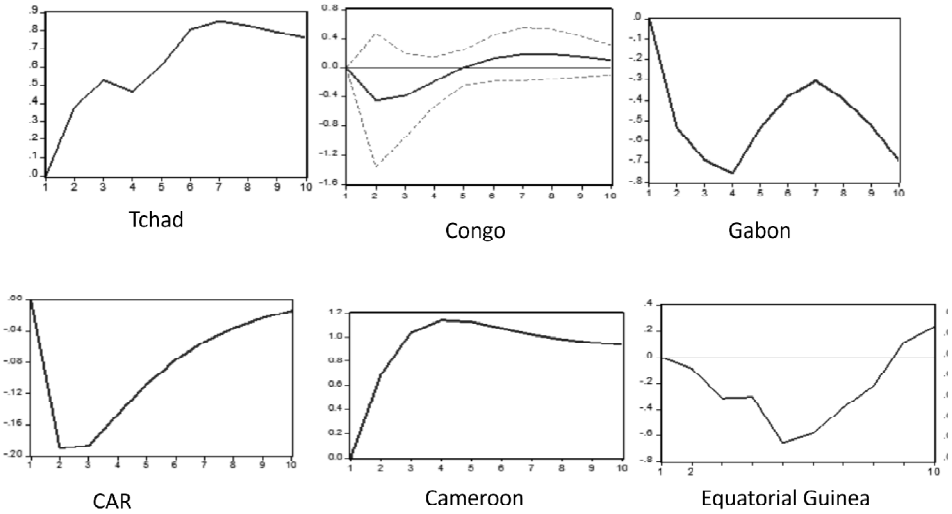


**Figure 3 : Response of the information asymmetry premium after the decline of the GDP growth rate**

*Source:* Authors

seems to be more victim of the effect of the financial accelerator. In fact, the increase in the information asymmetry premium, combined with the fall in the supply of credit and that of the GDP growth rate, rise the free reserves continuously and at an increasing rate, unlike in other countries where there is amortization after an average of five periods. Chad and Equatorial Guinea seem to be less victims, may be due to high oil revenues they enjoyed during the period 1995-2010, which would have enabled them to have good growth rates and to be less dependent on banking system

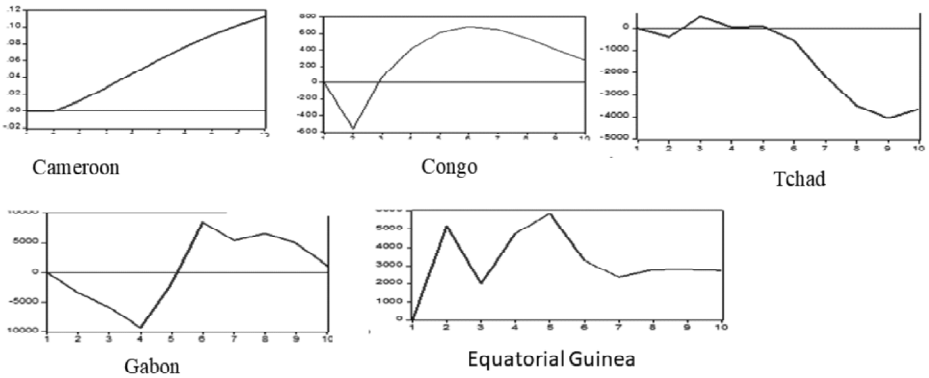


**Figure 4: Response of idle reserves after the increase of the information asymmetry premium and the co-joint decline of credit as well as the GDP growth rate**

*Source:* Authors

### *4.1.2. Analysis of the link between bank credit and the key rate in a context of financial accelerator*

Analyzing the link between credit and the key rate makes it possible to assess the effectiveness of the key rate policy carried out by the BEAC. In view of the previous results, this link should be very weak because of the increase in free reserves which is the product of the financial accelerator. Banks would seek less or no calls for bids of refinancing from the central bank. Moreover, the results of Table 1 show that there is no Co-integration relationship between bank credit and the call for bids' interest rate. Indeed, for short-term credit (CREDCT), the plus-values are superior to 5 per cent in all countries except Congo. Medium-term credit (CREDMT) also seems to have no link with TIAO in 4 countries (Chad, RCA, Equatorial Guinea and Gabon). For long-term credit (CREDLT), there are only two countries (Chad; Equatorial Guinea) where there is a link with TIAO. The p-values are below the chosen threshold of 5%. Overall, the BEAC's key interest rate policy by competitive bidding seems ineffective in stimulating the supply of credit.

**Table 1: Co integration relation between bank credit andcall for bids' interest rate**

| *Variables* | *TIAO(-1)* | *P-value* |
|---|---|---|
| Cameroon | | |
| DLOGCREDCT | - 0.019 | 0.6761 |
| DLOGCREDMT | - 0.0141 | 0.0013 |
| DLOGCREDLT | | - 0.085 |
| 0.1034 | | |
| Congo | | |
| DLOGCREDCT | - 0.261 | 0.0334 |
| DLOGCREDMT | - 0.180 | 0.0368 |
| DLOGCREDLT | - 0.194 | 0.4900 |
| Chad | | |
| DLOGCREDCT | - 0.108 | 0.4003 |
| DLOGCREDMT | 0.058 | 0.6488 |
| DLOGCREDLT | 0.591 | 0.0052 |
| CAR | | |
| DLOGCREDCT | - 0.02 | 0.7558 |
| DLOGCREDMT | - 0.413 | 0.0749 |
| DLOGCREDLT | - 0.035 | 0.7293 |
| Guinea | | |
| DLOGCREDCT | 0.101 | 0.5742 |
| DLOGCREDMT | - 0.131 | 0.1632 |
| DLOGCREDLT | - 4.733 | 0.0022 |
| Gabon | | |
| DLOGCREDCT | 0.321 | 0.1009 |
| DLOGCREDMT | 0.002 | 0.9516 |
| DLOGCREDLT | - 0.882 | 0.1457 |

Source: authors

### *4.1.3. System response to monetary policy shock after attenuation of the strength of the financial accelerator*

What would happen if the strength of the financial accelerator was attenuated after the information asymmetry premium was moved to zero? The results of the shock simulation of the key interest rate policy by tender in Cameroon show that after the fall in the TIAO, bank credit increases rapidly, while the loan interest rate decreases. Investment and consumption respond by increasing as a result of the increase in credit and the fall in the interest rate. A period later, we see an effect on economic growth, as the growth rate of GDP increases dramatically. This would be suggestive of a system where there is very little or no free reserves due to the swift reaction of credit and the TIAO's declining loan interest rate.

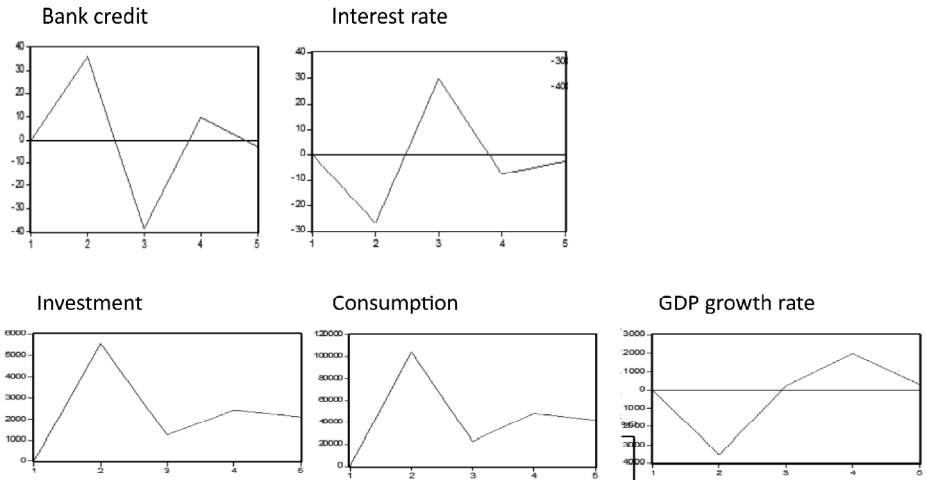


**Figure 5: Results of the simulation of the macroeconomic model constructed in *(3.2.3)***

*Source:* Authors

## *4.2. Discussion*

Researches on bank excess liquidity in CEMAC area are few and have been developed partially. By introducing the principle of the financial accelerator with the information asymmetry premium as a key variable, our results show that the problem of bank excess liquidity is deeper, because it is linked to the level of economic activity.It appears that thedegradation of economic activity leads to a sharp deterioration in the evolution context of banking activity by the aggravation of the problem of information asymmetry and especially of moral hazard, beyond what bankers might consider normal. In such a context, even the guarantee would no longer be sufficient to hope

for the credit granting, as long as their reliability is questioned and their realization difficult in case of non-repayment of the borrower. This bears consequences even on the monetary policy, since banks have no motivation to refund themselves by calls for bids. The main limitation of previous researches is that they have analyzed bank excess liquidity without caring about the connection between the economic activity and the accumulation of idle reserves, lack of a variable that could be helpful in that sense. Our study fills that gap. In this view, our results diverge from those of *Dollar and Hallward-Driemeier, 2000; Berger and al. 2005; Vo Thi, 2005*, for whom bank excess liquidity results from a drop in requests for credit. Nevertheless, our results are partially defended by those of *Nissanke and Aryeetey, 1998; Saxegaard, 2006; Wanda, 2007; Houdou and Kamgna, 2008; Fouda, 2009; Gammadigbe and Sodokin, 2013 et Beguy, 2013*in that they show how bank excess liquidity arises from the high cost of credit which implies high credit risk

Unlike*Doumbia's (2011*) results for the UMOA zone, bank excess liquidity does not have a direct link with the devaluation of the 1990s, it is rather the consequence of financial rigidities. As we have shown, financial rigidities (increase in the risk premium) negatively affect economic activity thus leading to more financial rigidities. This aligns with the results of researches on the financial accelerator *(Bernanke, 1983; Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Bernanke and al, 1999; Curdia and Woodford, 2010)*

According to our results, the banking system has lost confidence in the economic system and this loss of confidence is reflected in the setting of the risk premium beyond what would be in a normal setting. We tried to capture this marginal risk premium by what we called the information asymmetry premium. This challenges scientists on the structure of the risk premium. A good understanding of the structure of the risk premium would help to quickly identify the source of any problem of financial rigidity.

## 5. Conclusion and Recommendations

The aim of this article was to show how the financial accelerator mechanism generated by the information asymmetry premium can lead to bank excess liquidity which in turn renders the BEAC's key rate policy inoperative. In that sense, we formulated hypotheses (hypothesis 1, 2, 3, and 4) intending to establish the link between idle reserves, the information asymmetry premium and economic activity. Our results have shown that bank excess liquidity is the outcome of financial rigidity which itself is strongly determined by the dynamics of the economy, with the consequence of a weak refinancing policy through calls for tenders. Indeed, the simulation

of a macroeconomic model with a weakened financial accelerator effect, in other words with a very low financial rigidity reveals the reactions of the variables to monetary policy shocks in accordance with what central bankers would expect at the moment of their decision-making.Our results imply that the resolution of the problem of bank excess liquidity requires the attenuation of the principle of the financial accelerator, which materializes in financial rigidity. Since this financial rigidity is caused by the increase in the information asymmetry premium, any proposal that affects the reduction of the level of information asymmetry would be fruitful.

Therefore, we offer two categories of solution. Solutions that will have impact at short and medium term, but which would be insufficient as long as we do not consider solutions of long term impact.

For the first category of solution, we propose solutions that will have an immediate effect on bank liquidity but do not attenuate the effect of the financial accelerator, but rather increase the effectiveness of the refinancing policy, and solutions that will have progressive effects on idle reserves because the financial accelerator would have been attenuated. Regarding the first ones, the legislation should constrain banks to transfer all their currency accounts to the central bank, since they now invest in numerator device and are no longer interested in their intermediation activity. Public deposit accounts and microfinance institutions should be transferred to the central bank. A window for negotiable debt securities in favor of companies should be created within the central bank, with the aim of competing with banks. This would lead banks to innovate by creating financial products adapted to their context. Regarding the second ones, it is necessary to create credit bureaus and / or public credit registers, rating agencies for companies and individuals. All will have to operate in connection with financial institutions.

For the second category of solution, a restructuring of the economic fabric to make it more dynamic and healthy. This involves improving the business climate, policies aimed at developing the industrial sector for the on-site processing of raw materials and improving the quality of institutions.

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## APPENDIX 1
## Order of integration of variables

**Cameroon**

| *VARIABLES* | *CREDBANK* | *PASYM* | *TCPIB* | *INVEST* | *TIAO* | *TIPP* | *TIN* | *RESLI* | *REFIN* |
|---|---|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| PP | I(1) | I(1) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| Integration Order | I(1) | I(1) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| Decision | D(1) | D(1) | D(1) | D(1) | D(0) | D(0) | D(0) | D(1) | D(1) |

| *VARIABLES* | *logCREDCT* | *logCREDLT* | *logCREDMT* | *logREFIN* | *logRESLI* | *CONSO* | *INF* | *TIR* |
|---|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(1) | I(0) | I(2) | I(0) | I(0) | I(1) |
| PP | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) | I(1) |
| Integration Order | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) | I(1) |
| Decision | D(1) | D(1) | D(1) | D(0) | D(1) | D(0) | D(0) | D(1) |

ADF= Augmented Dykey-Fuller ; PP=Phillip-Perron;
*Source:* authors (collected fromEVIEWS software)

**Gabon**

| *VARIABLES* | *CREDBANK* | *PASYM* | *TCPIB* | *INVEST* | *TIAO* | *TIPP* | *TIN* | *RESLI* | *REFIN* |
|---|---|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(0) | I(1) | I(0) | I(0) | I(0) | I(0) | I(1) | I(1) |
| PP | I(1) | I(0) | I(0) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| Integration Order | I(1) | I(0) | I(0) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| Decision | D(1) | D(0) | D(0) | D(1) | D(0) | D(0) | D(0) | D(1) | D(1) |

| *VARIABLES* | *logCREDCT* | *logCREDLT* | *logCREDMT* | *logREFIN* | *logRESLI* | *INF* | *TIR* |
|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(2) | I(1) | I(2) | I(0) | I(0) |
| PP | I(1) | I(1) | I(1) | I(1) | I(1) | I(0) | I(1) |
| Integration Order | I(1) | I(1) | I(1) | I(1) | I(1) | I(0) | I(1) |
| Decision | D(1) | D(1) | D(1) | D(1) | D(1) | D(0) | D(1) |

ADF= Augmented Dykey-Fuller ; PP=Phillip-Perron
*Source:* authors (collected from EVIEWS software)

**Congo**

| *VARIABLES* | *CREDBANK* | *PASYM* | *TCPIB* | *INVEST* | *TIAO* | *TIPP* | *TIN* | *RESLI* | *REFIN* |
|---|---|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(0) | I(0) | I(0) | I(0) | I(0) | I(1) | I(0) |
| PP | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) |
| Integration Order | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) |
| Decision | D(1) | D(1) | D(0) | D(1) | D(0) | NS | D(0) | D(1) | D(0) |

| *VARIABLES* | *logCREDCT* | *logCREDLT* | *logCREDMT* | *logREFIN* | *logRESLI* | *INF* | *TIR* | |
|---|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(1) | I(1) | I(1) | I(2) | I(1) | I(0) |
| PP | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(0) |
| Integration Order | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(0) |
| Decision | D(1) | D(1) | D(1) | D(1) | D(1) | D(1) | D(1) | D(0) |

ADF= Augmented Dykey-Fuller ; PP=Phillip-Perron
*Source:* authors (collected from EVIEWS software)

**Equatorial Guinea**

| VARIABLES | CREDBANK | PASYM | TCPIB | INVEST | TIAO | TIPP | TIN | RESLI | REFIN |
|---|---|---|---|---|---|---|---|---|---|
| ADF | I(0) | I(0) | I(0) | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) |
| PP | I(0) | I(0) | I(0) | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) |
| Integration Order | I(0) | I(0) | I(0) | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) |
| Decision | D(0) | D(0) | D(0) | D(1) | D(0) | D(0) | D(0) | D(1) | D(0) |

| *VARIABLES* | *logCREDCT* | *logCREDLT* | *logCREDMT* | *logREFIN* | *logRESLI* | *INF* | *TIR* |
|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) |
| PP | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) |
| Integration Order | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) |
| Decision | D(1) | D(1) | D(1) | D(0) | D(1) | D(0) | D(0) |

ADF= Augmented Dykey-Fuller ; PP=Phillip-Perron
*Source:* authors (collected from EVIEWS software)

**Chad**

| *VARIABLES* | *CREDBANK* | *PASYM* | *TCPIB* | *INVEST* | *TIAO* | *TIPP* | *TIN* | *RESLI* | *REFIN* |
|---|---|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| PP | I(1) | I(1) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) |
| Integration Order | I(1) | I(1) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) |
| Decision | D(1) | D(1) | D(1) | D(1) | D(0) | D(0) | D(0) | D(1) | D(0) |

| *VARIABLES* | *logCREDCT* | *logCREDLT* | *logCREDMT* | *logREFIN* | *logRESLI* | *INF* | *TIR* |
|---|---|---|---|---|---|---|---|
| ADF | I(2) | I(1) | I(1) | I(0) | I(1) | I(0) | I(1) |
| PP | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(1) |
| Integration Order | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(1) |
| Decision | D(1) | D(1) | D(1) | D(0) | D(1) | D(0) | D(1) |

ADF= Augmented Dykey-Fuller ; PP=Phillip-Perron
*Source:* authors (collected from EVIEWS software)

**CAR**

| *VARIABLES* | *CREDBANK* | *PASYM* | *TCPIB* | *INVEST* | *TIAO* | *TIPP* | *TIN* | *RESLI* | *REFIN* |
|---|---|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(0) | I(1) | I(0) | I(0) | I(0) | I(0) | I(1) | I(1) |
| PP | I(1) | I(0) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| Integration Order | I(1) | I(0) | I(1) | I(1) | I(0) | I(0) | I(0) | I(1) | I(1) |
| Decision | D(0) | D(0) | D(1) | D(1) | D(0) | D(0) | D(0) | D(1) | D(1) |

| *VARIABLES* | *logCREDCT* | *logCREDLT* | *logCREDMT* | *logREFIN* | *logRESLI* | *INF* | *TIR* |
|---|---|---|---|---|---|---|---|
| ADF | I(1) | I(1) | I(2) | I(0) | I(1) | I(0) | I(0) |
| PP | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) |
| Integration Order | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) | I(0) |
| Decision | D(1) | D(1) | D(1) | D(0) | D(1) | D(0) | D(0) |

ADF= Augmented Dykey-Fuller ; PP=Phillip-Perron
*Source:* authors (collected from EVIEWS software)

**APPENDIX 2**
**Augmented Dickey-Fuller and Philip-Perron unit root test model**

Statistic test model augmented Dickey-Fuller (1979)

$$\begin{cases} \Delta y_t = \Phi y_{t-1} - \sum_{k=2}^{p} \gamma_k \Delta y_{t-k+1} + \varepsilon_t & ...(15) \\ \Delta y_t = \alpha + \Phi y_{t-1} - \sum_{k=2}^{p} \gamma_k \Delta y_{t-k+1} + \varepsilon_t & ...(16) \\ \Delta y_t = \alpha + \Phi y_{t-1} - \sum_{k=2}^{p} \gamma_k \Delta y_{t-k+1} + \beta t + \varepsilon_t & ...(17) \end{cases}$$

The test is based on the following hypotheses $H_o: \Phi = 1$ non stationarity; $H_1: \Phi < 1$ stationarity

a) statistic test model of Phillip and Perron (1988)

$$\begin{cases} \Delta y_t = \Phi y_{t-1} + \varepsilon_t & ...(18) \\ \Delta y_t = \alpha + \Phi y_{t-1} + \varepsilon_t & ...(19) \\ \Delta y_t = \alpha + \Phi y_{t-1} + \beta\left(t - \frac{T}{2}\right) + \varepsilon_t & ...(20) \end{cases}$$

The test is based under the null hypothesisof non-stationarity $H_0: \Phi = 0$ copposite the alternative stationarity hypothesis $H_1: \Phi = 0$