Effect of the Money Mass on the Macroeconomic Performance of the PAZF: Experience of CEMAC Countries

Ulrich Vianney Elisée KAGUENDO

Dschang School of Economics And Management in the University of Dschang
Researcher-Assistant at the Laboratoire de Recherche en Economie Fondamentale et Appliquée (LAREFA)

Abstract: **This study aims to analyze the effect of monetary mass on the macroeconomic performance in the countries of the Economic and Monetary Community of the States of Central Africa over the period from 1991 to 2016. We propose an econometric panel model applied to data from secondary sources in the 6 countries of the CEMAC "World development Indicator" area (WDI, 2017). First, we perform the preliminary tests (unit root tests, homogeneity test) and estimate the parameters of the model by the Generalized Method of Moment (GMM) in a system. Specifically, four results major emerge from our work. First, the rate of growth of the money mass has a statistically significant impact on the rate of economic growth in the sub region. Second, the growth of money mass has a significantly positive influence on the level of inflation in CEMAC countries. Third, money mass has a positive effect on employment. Fourth, domestic investment is the engine of economic growth for countries in the sub region. So monetary policy is not neutral in the CEMAC zone.**

Keywords: **Money Mass, Macroeconomic Performance, CEMAC, GMM.**

Code JEL: E31, E32, E52, B22, C13, O55.

I. INTRODUCTION

Less than ten years after the economic and financial crisis of 2007, CEMAC[1] is experiencing the particularly destabilizing effects of a new crisis, linked to the collapse of commodity prices. The fall in crude oil prices from an average of US$104.1 per barrel in 2013 to US$50.9 per barrel in 2015 has disrupted the macroeconomic balances of the member states of the Union, five of which are net exporters and highly dependent on budget revenues (FREF-CEMAC, 2017)[2]. As a result, this fall simultaneously worsened growth prospects in the short and medium term, causing an accentuation of national and regional balance of payments deficits and a collapse of foreign exchange reserves.

In this context, growth slowed in 2016 in all CEMAC countries due to the polarization of their economies based largely on exports of basic raw materials. According to the CEMAC Multilateral Surveillance Report (2017), the CEMAC growth rate stood at -0.4% in 2016 against 1.8% in 2015. It would firm up slightly to 0.4% in 2017. Inflation remained moderate during the year 2016 in CEMAC, with a rate set at +1.1% on annual average against +2.5% in 2015. This inflation trend is explained by the decline in the prices of certain items commonly used by households, and those of food and petroleum products (in Cameroon, Central African Republic, Gabon, Equatorial Guinea and Chad).

Thus, the deficit in the overall balance of payments worsened to XAF 3 148.1 billion in 2016 against XAF 3 100.2 billion in 2015. Public finance management in CEMAC member states in 2016 resulted in a deterioration of public accounts, with a widening of the budget balance deficit, with the commitment base excluding grants standing at XAF 3 177.5 billion (-7.2% of GDP), against XAF 1 900.7 billion in 2015 (-4.2% of GDP). As a result, the monetary situation in CEMAC was marked by a decline in net external assets, which fell by 59.7% to 2 281.6 billion at the end of December 2016 following the 19.3% drop in the net external position of the Monetary Authorities. As a result, the currency's external coverage ratio fell to 59.1% in 2016 from 77.1% in 2015. Net claims on governments rose sharply by 731.9% to reach 2,205.5 billion at end-December 2016, as a result of cash tensions in all the countries of the sub region. Loans to the economy declined by 5.2% in 2016 against a 9.9% increase in 2015. Reflecting these contrasting trends, the money supply in the CEMAC zone declined by 4.6% in 2016 after having virtually stagnated in 2015 (+0.1%).

However, the term money mass[3] covers currency in circulation plus bank deposits. According to Mishkin (2010), an asset becomes money because agents believe that it will be accepted as payment by others. Thus, the formulation of CEMAC[4] monetary policy implicitly follows the same logic

---

[1] The Economic and Monetary Community of Central African States (CEMAC) was created in 1996 and is composed of six countries: Cameroon, CAR, Congo, Gabon, Equatorial Guinea and Chad.
[2] Programme des Réformes Economiques et Financières de la CEMAC (PREF-CEMAC, 2017).

[3] By convention, the money mass is measured by interlocking monetary aggregates that group together the various monetary and quasi-monetary assets. M1, also known as money mass.
[4] Article 21 of the convention governing the UMAC stipulates that the BEAC, without prejudice to the objective of price stability, shall support the general economic policies developed in the monetary union.

as the formulation of support to economic activity understood as a possibility of cyclical stabilisation.

Moreover, the question of analysing the impact of monetary shocks on inflation, activity, etc. is not clear-cut in the economic literature. The various monetary aggregates play an important role both in understanding the financial behaviour of economic agents and in defining and conducting monetary policy (Ngerebo, 2016; Bikai and Kenkouo 2015; Dimitrijevic and Lovre, 2013; Mishkin, 2007, 2009, 1996; Beaudry et al. (2001); Reynard, 2007; Bernanke and Gertler, 1995; Sims, 1992).

This work shows the extent to which monetary policy has become an essential component of economic policy. Indeed, monetary policy aims to achieve the main objectives of Kaldor (1971)[5] magic square: growth, full employment, price stability, and external balance. In other words, monetary policy must be at the service of economic development (Mouhoubi, 1991). As a result, there is a dual mandate within the statutes of the FED to pursue simultaneously the objectives of price stability and economic growth.

Faced with these dilemmas of a constantly changing economic environment, from the recent experiences of CEMAC countries, this article focuses on the effect of money supply on macroeconomic performance in UMAC countries and thus joins most of the work on this issue in developing countries. For the main objective of the monetary policy of the Bank of Central African States (BEAC) is to ensure monetary stability and to support the general economic policies drawn up by the States (see BEAC statutes).

Through the various previous works cited on money, it is difficult to dismiss the idea that the money supply through monetary policy has a significant influence on the macroeconomic performance of CEMAC countries. Consequently, it must be well conducted so that it can achieve the final objectives that the monetary authorities have set for themselves.

Hence our main research question: *What is the effect of the money mass on indicators of macroeconomic performance of CEMAC countries?*

Indeed, we will deal with the issue by taking into account the annual growth rate of the money supply. The money supply (M2) enters the trade system and stimulates growth (real GDP), the rate of inflation, investment, and employment when the supply of money coincides with the demand for money. When the supply of money no longer coincides with the demand for money, economic activity is slowed down or there is capital flight from the countries in the BEAC's issuing zone.

In view of the problem of our study and the questions posed, *the general objective of this research is to evaluate the effect of the variation of the monetary aggregate (M2) on the* indicators *of macroeconomic performance of the CEMAC countries over the period from 1991 to 2016.* From this objective, we formulate the following central hypothesis: *The money supply would positively influence the macroeconomic performance indicators of the CEMAC countries.*

The interest of our study is to highlight the effect of the money supply on real variables, to show the importance and centrality of monetary policy for any economic policy objective, thanks to the methodological approach used. For the purposes of this article, the estimation method used is that of GMM in the Arellano and Bover (1995) and Blundell and Bond (1998) systems over the period 1991-2016 for the six CEMAC countries. This research could provide economic policy decision-makers and more particularly the authorities in charge of monetary and financial issues with an element of appreciation on the monetary policy conducted by the BEAC since the reforms of the 1990s until the conference of Heads of State at the end of 2016.

Thus, the continuation of the study is organized as follows. The second section presents a selective synthesis of the theoretical and empirical literature on macroeconomic performance. The third section outlines the methodological approach and data for the study. The fourth section analyses the results by showing the effect of the money supply on economic growth, inflation, investment and employment. And the fifth section proposes recommendations and economic policy, followed by the conclusion.

II. LITERATURE REVIEW

➤ *Theoretical Review*

The theoretical debate on the status of money between the liberal current (Smith A. 1776; Say J.B. 1803) and the interventionist current (Keynes 1936) was revived with the monetarist counter-revolution (Friedman 1956). Classical and neoclassical analysis demonstrates neutrality through the super-neutrality of money according to John Muth (1961). Muth J.'s (1961) work, which was microeconomic in nature, was transposed to macroeconomics by Lucas R. (1972) and Sargent T. (1972). (1975). Their work demonstrates the existence of an economy in which the maximizing behaviour of agents neutralizes the effects of monetary policy. According to the model constructed by Lucas R. (1972), when monetary policy is conducted, it is perfectly anticipated because individuals understand what is being done and are able to anticipate and forecast the impact of that policy on the economy and the effects of a possible increase in action, and the action will ultimately have no effect.

Following the 1929 crisis, which undermined the liberal explanations of market mechanisms and the status accorded to money. The difficulty in apprehending and analysing the existence of massive unemployment resulting from this crisis, among other things, led to the resurgence of so-called "interventionist" economic thinking (Mvondo, 2011). Faced with this situation of market forces' inability to restore a full

---

[5]Beitone A et al (2008): "Dictionnaire des Sciences Economiques", 2nd ed, www.armandcolin.com, pp. 329-330.

employment equilibrium, John Maynard Keynes (1936) will show that demand has a dominant role on the one hand over supply. Followed by the New Keynesian School that the demonstration of monetary non-neutrality becomes effective through the work of Fisher S, (1977), Gordon R. (1980), Stiglitz J. (1984, 1987), Mankiw G. (1987). (1985), Akerlof G. and Yellen Y. (1985).

Keynesian analysis has postulated rather than demonstrated the existence of rigidities. With the counter-revolution of expectations initiated by the monetarists and continued by the New Classical Economy, this justification appeared necessary. The programme of the New Keynesian School was thus outlined. To this end, the main authors agreed, in reaction to the conclusions of the New Classical Economy, on two fundamental points: on the one hand, the importance of market imperfections in explaining economic fluctuations and, on the other hand, the non-neutrality of money. Thus, our study finds its theoretical foundations and aligns itself behind the second approach[6]. This suggests the possibility of implementing the conditions necessary for the success of the monetary reforms undertaken by the heads of state in December 2016.

> ➤ *Empirical Review*

This debate will be continued by several theoretical and empirical studies below Some authors highlight the weakness of the transmission channels of monetary policy and particularly the interest rate channel, due to the weakness of the institutional framework, embryonic financial markets, bank overliquidity and the dominance of the banking sector, (Mishra et al. 2010; Saxegaard, 2006; Buigut, 2009; Mishra et al., 2016).

Other authors, however, have found that transmission channels are effective in some developing countries (Berg et al. 2013; Davoodi et al. 2013; Saad, Mohammed and Zakaria, 2011; Cheng, 2006; Uanganta and Ikhide, 2002;).

In the light of our topic focusing on macroeconomic performance, this leads us to present what economic growth is, following a more optimistic presentation given by Solow's (1956) model describing a natural growth model. In the 1980s, endogenous growth theories appeared, with authors such as (Romer, 1986, 1990) and (Lucas, 1988) challenging some of the conclusions of Solow's model. It is thanks to the theory of endogenous growth that monetary policy plays an important role in the literature on economic growth. Moreover, the objectives of monetary policy are in line with the objectives of economic policy, of which it is one of the main instruments, together with fiscal policy (growth, full employment, price stability and external equilibrium). It also strives to achieve the other objectives of the economic policy described as the Keynesian triangle: growth, full employment and external balance.

According to Shari (2007), real rather than price stability is ultimately the most important objective for attracting investors and achieving sustainable development. Thus, an excessive or exclusive focus on price stability can have a negative impact on growth. According to Jahati (2007), countries with a fixed exchange rate regime should not adopt a strict strategy of targeting inflation (at an annual rate of 3% or less), but should alternate with a growth target by facilitating financing for investment. In this case, the ultimate objective of monetary policy should be the quantification of the volume of money needed in the economy. Other authors, such as (Judd and Rudebusch, 1998), stress that monetary policy is "good" if it allows an effective trade-off between stabilisingoutput (short-term objective) and maintaining price stability (medium- and long-term objective), which are desirable objectives from the point of view of social welfare. Nowadays, this position is more widely shared by central banks in developed countries, which seem to give monetary policy a dimension of support for economic activity in order to mitigate the effects of the financial crisis. Moreover, endogenous growth models by specifying that bank expansion has a positive effect on economic growth by allocating more savings to investment implicitly mark the importance of monetary policy for any economic growth objective (Ramsey, 1993).

Finally, existing studies (Bikai and Essiane (2018); Bikai and Kenkouo (2015); Amadou Bobbo (2016); Keungne, Léo, and Ousman (2014); Fouda Ekobena. (2013); Mallaye (2009); Douzounet (2007); Ondo Ossa (2005); Krause (2003); Orphanides (2002); Kahn and Knight (1991)), lead to divergent results. Limitations noted in previous work on money supply effects are due to the fact that this field of study has not yet been sufficiently explored solely for CEMAC, like other African sub-regions, and new research is therefore needed. Thus, the challenge of this research is to analyse the effect of the money supply on indicators of macroeconomic performance of CEMAC countries.

III. METHODOLOGY STRATEGY

3.1 data

Econometrics of panel data takes into account both individual and temporal data, which makes it possible to better understand the various factors likely to explain growth and to take into account individual and temporal specificities. The population of the study is made up of the six CEMAC[7] countries. These countries have a common Central Bank which defines and implements the monetary policy applicable in the six states. The data collected for this study come from secondary sources. They were extracted from the World Bank database in the *"World Development Indicators and Africa Development Indicators (2017)"*. They are quantitative in nature. Our study period is from 1991 to 2016. The peculiarity of this period is that it is a period during which monetary policy underwent several reforms, notably those of the 1980s,

---

[6] The non-neutrality of the currency (i.e. the currency influences the economies of the CEMAC sub-region).

[7] Cameroon, Central African Republic, Chad, Congo, Gabon and Equatorial Guinea.

1990s and the end of 2007. In particular, this is the period during which the CEMAC countries started their stabilisation and adjustment programmes for their economies under the aegis of the Bretton Woods Institutions, following the example of many African Franc Zone Countries (AFZC). Moreover, it was during this period that the devaluation of the CFA franc took place. The frequency of the data seriesusedis annual.

3.2 Variables

Variables are often assimilated to an indicator that captures the evolution over time and space of a quantifiable phenomenon. Thus, two types of variables will be used to analyse the effect of the money supply on macroeconomic performance indicators in CEMAC countries. These are the variables to be explained and the explanatory variables grouped in the table below (Appendix 1):

3.3 Econometric Modelling

Panel data are a combination of time series and cross-sections. They consist of a set of temporal observations (t=1... T) Over several statistical units (i=1... n).

One of these techniques is the Generalized Method of Moment (GMM) on dynamic panel. This method provides solutions to the problems of simultaneity bias, inverse causality and omitted variables. For our model, we have chosen a GMM estimation in a dynamic panel system[8]. The model seeks to explain the dynamics of the gross domestic product per capita, the inflation rate, the employment level and the investment of each country by the money supply of the CEMAC member countries. In a first step, we retain the conceptual framework generally used to analyze the impact of the money supply on the indicators of macroeconomic performance at a given date or period by choosing the econometric approach below.

However, the broad outlines of the motivation for using GMMs can be found in Arellano and Bond (1991) and Blundell and Bond (1998), which provide the arguments for using the GMM method. It allows endogeneity to be adjusted not only at the level of the money supply variable but also at the level of the other explanatory variables by using a series of instrumented variables generated by the lags of the variables. For the purposes of this article, the estimation method used is GMM in the Arellano and Bover (1995) and Blundell and Bond (1998) systems, since it provides a better estimate. The efficiency of GMM estimation relies on the validity of the Sargan/Hansen test, which allows us to test the validity of the lagged variables that we use as instruments.

Consider the dynamic equation to be estimated using the GMM (generalized method of moments) dynamic panel method as follows:

$$y_{it} = \alpha_0 + \alpha_1 y_{it-1} - 1 + \beta M_{it} + \delta K_{it} + \mu_i + \nu_t + \eta_{it}$$

$$(1)$$

With t = 1991, 1992, 1993 ... 2014; i = 1, 2 ...6 (the six CEMAC countries)

With $0 < \alpha < 1$; α_0 **is** the Constant; it = i.e   . Individual i a **t** period t and $\alpha, \beta, \delta,$ are parameters to be estimated. where y_{it} represents the variable to be explained (variables of macroeconomic performance at period t), $\boldsymbol{y_{it-1}}$ the logarithm of the lagged value, M_{it} the growth rate of broad money at period t (M_2), $_{Kit}$ a vector of conditional information variables associated with the other factors that control growth, employment, inflation and investment, and finally $_{\varepsilon it}$ is the error term which is white noise.

Thus, the following summary of the estimation techniques depends on the assumption used.

3.4 Empirical models

➢ *The effect of money mass on economic growth*

The model described below allows the estimation of the effects of money supply on economic growth according to assumption H1:

Hence the final model of the economic growth equation to be estimated becomes:

$$TPIBR_{it} = j_0 + j_1 TPIBR_{it-1} + j_2 M2_{it} + j_3 TINFL_{it} + j_4 TCHR_{it} + j_5 RESEXT_{it} + j_6 TI_{it} + j_7 EMPL_{it} + j_8 INVEST_{it} + j_9 CE_{it} + j_{10} DPUB_{it} + j_{11} TPOP_{it} + j_{12} OUVEXT_{it} + j_{13} IDE_{it} + \mu_i + \nu_t + \eta_{it} \quad (2)$$

With $\boldsymbol{j_0}$ the constant, $\boldsymbol{j_1}$ to $\boldsymbol{j_{13}}$ the regression coefficients for the economic growth targets and t = 1991 ...2014;   i = 1, 2... 6 (Six CEMAC countries).

$TPIBR_{it}$ = the growth rate of real GDP in period t;

$TPIBR_{it-1}$ is the growth rate of real GDP per capita lagged one period for country i at time t.

$\boldsymbol{\mu_i}$ = individual effect; $\boldsymbol{\nu_t}$ = time effect; $\boldsymbol{\eta_{it}}$ = cross effect and $\varepsilon_{it} = \mu_i + \nu_t + \eta_{it}$ the error term.

➢   *The effect of money mass on the rate of inflation*

The inflation equation is much more explicit and takes into account our second assumption H2.

The final model of the inflation equation to be estimated becomes

$$TINFL_{it} = \gamma_0 + \gamma_1 TINFL_{it-1} + \gamma_2 M2_{it} + \gamma_3 TI_{it} + \gamma_4 TCHR_{it} + \gamma_5 TPIBR_{it} + \gamma_6 INVEST_{it} + \gamma_7 CE_{it} + \gamma_8 DPUB_{it} + \gamma_9 TPOP_{it} + \gamma_{10} OUVEXT_{it} + \gamma_{11} EMPL_{it} + \mu_i + \nu_t + \eta_{it} \quad (3)$$

With γ_0 the constant, γ_1 à γ_{11} the regression coefficients for the target inflation level, and εit the error term.

---

[8] A dynamic model is one in which one or more lags of the dependent variable appear as explanatory variables.

➢ *The effect of the money mass on employment*

The selected employment equation takes into account the third assumption H3 in our study. Hence, the final equation is as follows:

$$EMPL_{it} = \delta_0 + \delta_1 EMPL_{it-1} + \delta_2 M2_{it} + \delta_3 TINFL_{it} + \delta_4 TPIBR_{it} + \delta_5 INVEST_{it} + \delta_6 TI_{it} + \delta_7 CE_{it} + \delta_8 TCHR_{it} + \delta_9 DPUB_{it} + \delta_{10} TPOP_{it} + \delta_{11} OUVEXT_{it} + \delta_{12} IDE_{it} + \mu_i + \nu_t + \eta_{it} \quad (4)$$

With $\boldsymbol{\delta_0}$ the constant, $\boldsymbol{\delta_1}$ to $\boldsymbol{\delta_{12}}$ the coefficients of the variables, $\boldsymbol{\varepsilon_{it}}$ the error term.

➢ *The effect of the money mass on investment*

The investment equation incorporates the dynamics that allow the economy to balance. For it takes into account our fourth assumption, H4. Theoretically we know that there is a positive relationship between investment, money supply and economic growth (if we also refer to Keynesian theory, i.e. the Keynesian multiplier). Thus, the final model to be estimated is written in the form below:

$$INVEST_{it} = \beta_0 + \beta_1 INVEST_{it-1} + \beta_2 M2_{it} + \beta_3 INFL_{it} + \beta_4 TPIBR_{it} + \beta_5 CE_{it} + \beta_6 TCHR_{it} +$$

$$\beta_7 DPUB_{it} + \beta_8 TPOP_{it} + \beta_9 OUVEXT_{it} + \beta_{10} IDE_{it} + \beta_{11} RESEXT_{it} + \beta_{12} TI_{it} + \varepsilon_{it} \quad (5)$$

With β_0 the constant, β_1 to β_{12} the coefficients of the variables, $\boldsymbol{\varepsilon_{it}}$ the error term.

However, we estimate four different models as described above.

IV. RESULTS AND INTERPRETATION

This section presents the results of our model estimates as well as a detailed interpretation of our models with respect to the macroeconomic, monetary policy, and institutional situation of CEMAC countries and the existing literature. The aim is to assess the effect of the money supply on real GDP, inflation, investment and employment in the countries of the sample. To do so, we are reassured of the stationarity of the variables we use by highlighting the stationarity test in the sense of ImPesaran-Shin (see Appendix).

➢ Results and interpretation of the test of hypothesis 1 (the effect of money mass on economic growth in CEMAC countries)

Table 1: Estimated relationship between money mass and real GDP growth rate (GMM)

VARIABLES	Model1	Model2	Model3	Model4	Model5
TPIBR	0.326*** (0.0615)	0.306*** (0.0618)	-0.0812 (0.0582)	-0.0594 (0.0589)	-0.0527 (0.0558)
D.M2	-0.967* (0.508)	-0.767 (0.513)	-1.354*** (0.399)	-1.284*** (0.401)	-1.076*** (0.394)
TINFL		-0.315** (0.149)	0.182 (0.462)	0.203 (0.464)	-0.0634 (0.604)
TCHR			0.158*** (0.0141)	0.168*** (0.0146)	-0.00244 (0.0452)
RESEXT			-0.204 (0.465)	-0.289 (0.467)	0.340 (0.474)
TI				-0.189*** (0.0645)	-0.239*** (0.0648)
EMPL					0.0501 (0.299)
INVEST					0.00268 (0.117)
EC					-0.946*** (0.341)
DPUB					-0.550* (0.292)
TPOP					-3.565 (3.725)
OUVEXT					-0.294*** (0.0440)
FDI					-0.155 (0.555)
Constant	4.439*** (1.306)	7.398*** (1.913)	-9.239*** (2.070)	-8.181*** (2.108)	25.46 (18.36)
Wald chi2	44.41	49.45	214.97	221.81	315.83
Proba chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Comments	138	138	138	138	138
Number of pays	6	6	6	6	6

Source: Author construction from STATA 13 software

NB: *The signs*, **, ***, represent the significances at the 10%, 5% and 1% thresholds respectively. The figures in brackets represent the standard error (standard deviation).*

These results are analyzed in general and then specifically in the following paragraphs:

The table shows that all indicators of macroeconomic performance affect the growth rate to varying degrees. And the regression shows that this model is globally significant at a threshold of 1% for the (Proba chi2 = 0.0000), so the exogenous variables normally explain the endogenous variable. The indicators M2, TI, CE, DPUB, OUVEXT, have a negative and significant impact on the growth rate for the GMM estimator in system alone INFL, TCHR, TPOP, IDE negative and non-significant impact. On the other hand, the variables RESEXT, EMPL, INVEST have a positive impact on the growth rate of RDP.

Moreover, the relationship is robust because it remains negative for all the different models listed (i.e., the money supply acts negatively through the inflation rate channel because inflation is the source of uncertainty). So a 100% increase in the money supply leads to a 107.6% drop in the GDP per capita growth rate. This result runs counter to the work of Romer (1990) who stresses that a restrictive monetary policy depresses economic activity. According to Bikai and Essiane (2018), who used Bayesian estimation of structural VAR models (BSVAR) on individual data for each CEMAC country, they find that monetary policy shocks do not seem to exert a strong influence on economic growth in the different CEMAC countries.

The inflation rate is negatively related to the growth rate but this relationship is not significant. Therefore, the inflation rate should not be increased expressly on the grounds of improved growth. So price stability is not conducive to the development of economic activity, but simply allows the economy to maintain itself. The interest rate has a negative influence on economic growth, it contributes to our expectations and confirms economic theory.

Investment has a positive and insignificant effect on economic growth. It is, moreover, the most contributing variable to the explanation of economic growth in the CEMAC zone, as it justifies the economic theory according to which investment is the engine of growth. However, in the CEMAC, for monetary policy to have a positive effect on economic growth under these conditions, it is necessary for it to encourage investment, in particular by promoting a stable macroeconomic framework and maintaining interest rates at levels likely to attract investors. The population growth rate has a coefficient which is negative (an unexpected sign). This result is almost contrary to endogenous growth theories such as those of Romer (1989) and Pichette (1998), which stipulate that human capital is positively linked to growth since it leads to positive externalities.

In summary, the estimation of our growth equation reveals the existence of a significant negative relationship between money supply and GDP in the subregion. This is consistent with the studies conducted by Fouda (2013) in CEMAC which show that the monetary variable of the same period has a negative influence on economic growth. Thus, the solutions would be to increasingly liberalize the banking system in order to ensure more economic growth, to control the supervision and regulation of the financial system, and to reduce information asymmetry. Hypothesis H1 is rejected and confirms the ineffectiveness of monetary policy in CEMAC.

Following the analysis and interpretation of the results of model 1, the analysis and interpretation of the second model is now required.

➢ *Results and interpretation of the test of hypothesis 2 (*the effect of the money mass on inflation in CEMAC countries)

Hence, the results of the estimates:

Table 2: Relationship between money mass and inflation (GMM)

VARIABLES	Model 1	Model 2	Model 3
L.TINFL	0.846*** (0.0421)	0.835*** (0.0437)	0.779*** (0.0474)
D.M2	0.313** (0.152)	0.270* (0.150)	0.396** (0.163)
TI		-0.0862*** (0.0260)	-0.0720** (0.0291)
TCHR		0.00582 (0.00722)	0.0421** (0.0180)
TPIBR			-0.0105 (0.0369)
INVEST			-0.0952* (0.0506)
EC			-0.256* (0.134)
DPUB			-0.105 (0.121)
TPOP			1.847 (1.504)
OUVEXT			0.00157 (0.0219)
Empl			-0.271 (0.944)
£Constant	1.501*** (0.528)	1.777* (1.008)	-0.311 (5.015)
Wald chi2	426.63	446.49	457.41
Prob chi2	0.0000	0.0000	0.0000
Comments	138	138	138
Number of pays	6	6	6

Source: Author's construction from STATA 13 software

NB: *The signs*, **, ***, represent the significances at the 10%, 5% and 1% thresholds respectively. The figures in brackets represent the standard error (standard deviation).*

These results are analysed in general and then specifically in the following paragraphs.

The table shows that all indicators of macroeconomic performance affect the rate of inflation to varying degrees. And we notice in this regression that our model is globally significant at the 1% threshold because (prob> chi2 = 0:0000) as in the first regression all exogenous variables explain the

endogenous variable. The M2 indicators, TCHR, have a positive and significant influence on the inflation rate for the GMM system estimator; also the TI, INVEST, CE, have a negative and significant influence. On the other hand, the variable PIBR, DPUB, EMPL, has a negative impact and the TPOP, OUVEXT, has a positive but insignificant influence on the inflation rate of CEMAC countries.

The growth of the money mass raises the rate of inflation and that there is a positive and significant link between the NIFL and the money supply. Moreover, the relationship is robust because it remains positive for all the different models listed. So an increase in the money supply leads to an increase in the rate of inflation according to the result of models 1, 2, and 3 in equation 2. These results are consistent with those of King (2002), which find a correlation between growth in the quantity of money and inflation and no link between money growth and growth in real output. Thus, the Phillips curve suggests that, through expansionary monetary policy, it is possible to obtain additional economic growth that should translate into lower unemployment in the short run. Thus, the increase in the rate of inflation resulting from this expansionary policy would be the price to be paid for economic growth (Phillips 1958). Moreover, this result can be explained by the weak financial development of CEMAC, as suggested by the work of Mishra et al, (2010); Saxegaard (2007).

The interest rate has a negative influence on inflation, which is in line with our expectations. In fact, an increase in the interest rate by one unit leads to a decrease in the inflation rate, however, this result is significant. This confirms economic theory. Therefore, an increase in the exchange rate by one unit leads to an increase in the inflation rate. An increase of 5% in the growth rate increases the inflation rate by 1.05%, so we can say that the growth rate is not a real source of inflation in the CEMAC countries. Investment has a negative and significant effect on the inflation rate. A decrease in the share of investment of one unit leads to a decrease of the latter by -0.0952 times this unit. Government expenditure has a negative and insignificant impact on the inflation rate. The external openness variable also has a positive and insignificant effect. In fact, any unit increase in external openness leads to an increase in the inflation rate. This explains why the source of inflation in CEMAC countries is external. Finally, the employment variable also has a negative and insignificant effect on the inflation rate.

On the basis of our results, we can refer to the work of Quant à Levy (1998), who highlighted the correlation between inflation and economic performance. To do so, he evaluated the effects of (high or low) inflation on output and capital expenditure over the period 1960-1988 in the United States. He used VAR modelling to estimate the sensitivity of economic performance to an innovation in inflation. Thus, he used quarterly observations for the variables used, i.e., real GDP, inflation, and so on. The results show that high and volatile inflation is detrimental to economic performance while low and stable inflation improves economic efficiency and performance by reducing the welfare "*dead load*" and establishing a more stable macroeconomic environment that reduces the cycles of aggregate demand swings. Empirically, the results show that an inflation "*innovation*" tends to persist; a 1% inflation "*innovation" has* a significant and negative impact on economic output.

After the analysis and interpretation of the results of model 2, the analysis and interpretation of the third model should be carried out.

➢ *Results and interpretation of the test of hypothesis 3* (impact of money mass on employment in CEMAC countries)

Table 3: Relationship between money mass and employment (GMM)

VARIABLES	Model 1	Model 2	Model 3	Model 4
L.empl	-0.181*** (0.0646)	-0.181*** (0.0650)	-0.170** (0.0666)	-0.210*** (0.0707)
D.M2	0.00396 (0.0131)	0.00185 (0.0135)	0.0116 (0.0143)	0.00194 (0.0154)
TINFL		0.00310 (0.00400)	0.00444 (0.00411)	-0.0203 (0.0212)
TPIBR			0.00554** (0.00222)	0.00261 (0.00331)
INVEST				0.00882* (0.00525)
TI				-0.00441 (0.00271)
EC				-0.00899 (0.0147)
TCHR				-0.00386** (0.00185)
DPUB				0.0151 (0.0120)
TPOP				-0.261* (0.156)

OUVEXT				-0.000919 (0.00214)
FDI				0.0282 (0.0209)
Constant	0.0471 (0.0320)	0.0185 (0.0488)	-0.0338 (0.0539)	0.709 (0.512)
Wald chi2	8.49	9.04	14.9	28.18
P chi2	0.0143	0.0288	0.0049	0.0052
Comments	132	132	132	132
Number of pays	6	6	6	6

Source: Author's construction from STATA 13 software

NB: *The signs*, **, ***, represent the significances at the 10%, 5% and 1% thresholds respectively. The figures in brackets represent the standard error (standard deviation).*

These results are analysed in general and then specifically in the following paragraphs:

This regression shows that the model is not globally significant (prob> chi2 =0.0052) i.e. all exogenous variables do not normally explain the endogenous variable. The indicators M2, TINFL, TPIBR, INVEST, DPUB, IDE, have a positive influence on employment for the GMM system estimator; also TI, CE, TCHR, TPOP, OUVEXT, have a negative influence on the level of employment in CEMAC countries.

Looking at the table, the estimation results show that the money supply has a positive effect on employment. Thus, monetary policy is not neutral in CEMAC countries; rather, it should be better exploited. The result of economic growth and employment are positively related and significant according to the result. So we explain this by saying that growth in CEMAC countries favours the level of employment. A 5% increase in the growth rate increases the level of employment. Investment also confirms a positive and significant effect at 10% on the level of employment. Moreover, a 1% increase in investment leads to a 0.882% increase in investment.

Moreover, this result suggests that any increase in the population of the sub-region by one unit leads to a reduction in the level of employment by 26.1%. Finally, employment is positively influenced by money supply growth. A 100% increase in the volume of money supply creates a 26.5% increase in employment.

Following the analysis and interpretation of the results of model 3, the analysis and interpretation of the fourth model is now required.

➢ Results and interpretation of the test of hypothesis 4 (Effect of money mass on investment in CEMAC countries).

Table 10: Relationship between money mass and investment (GMM)

VARIABLES	Model 1	model2	model3	model4
L.INVEST	0.866*** (0.0425)	0.827*** (0.0409)	0.656*** (0.0364)	-0.0903*** (0.0324)
D.M2	2.346*** (0.655)	2.534*** (0.628)	2.876*** (0.497)	0.0835 (0.228)
TINFL		-0.202 (0.183)	-0.107 (0.144)	-0.0961 (0.357)
TI		0.453*** (0.0986)	0.437*** (0.0779)	-0.0964*** (0.0372)
TPIBR			0.727*** (0.0706)	0.00641 (0.0420)
EC				0.575*** (0.197)
TCHR				0.372*** (0.0196)
DPUB				0.125 (0.164)
TPOP				4.096* (2.091)
OUVEXT				-0.130*** (0.0248)
FDI				-0.128 (0.315)
RESEXT				0.176 (0.288)
Empl				2.263* (1.332)

Constant	3.762* (2.226)	2.818 (3.012)	3.240 (2.379)	-19.08*** (6.055)
Wald chi2	420.76	505.16	915.62	6562.77
Prob chi2	0.0000	0.0000	0.0000	0.0000
Comments	138	138	138	138
Number of pays	6	6	6	6

Source: Author construction from STATA 13 software

NB: *The signs*, **, ***, represent the significances at the 10%, 5% and 1% thresholds respectively. The figures in brackets represent the standard error (standard deviation).*

The results appear interesting because the regression is globally significant at the 1% threshold because the (Prob chi2= 0.0000), as in the first and second regression of our study all exogenous variables explain the endogenous variable.

From this estimation, only the variables M2, TI, TPIBR, CE, TCHR, TPOP, OUVEXT and EMPL are significant. Indeed, they suggest that an increase in the money supply of 1% leads to an increase in the investment rate of 8.35% compared to the results of GMM model 4 in system. Moreover, a 1% decrease in the interest rate leads to a 9.64% increase in the investment rate.

The coefficient of the TPIBR variable is positive, which means that the growth rate of real gross domestic product has almost no effect on investment in CEMAC countries. In fact, a 1% increase in FIRRICs only leads to an increase in the investment rate. Inflation is negative but not significant, which means that the inflation rate does not really affect investment in CEMAC countries.

A 1% increase in credit to the economy increases domestic investment by 57.5%. Moreover, as Moukala (2013), Bikai and Kenkouo (2015) suggest, the bank credit channel is very important to stimulate investment in order to achieve inclusive growth in the CEMAC zone. This is also due to the financing of profitable projects in the sub-region and this positive correlation is due to the growth in the level of credit granted which is also due to lower lending rates of commercial banks, which favour investment in these countries. The coefficient of the variable, the rate of foreign direct investment (FDI) is negative but not significant, suggesting that the increase in FDI has no effect on the investment rate in the countries in the sample.

Overall, from our estimate, we note that the money supply has a positive and significant effect on investment in the countries in the sample.

V. CONCLUSION AND IMPLICATIONS

5.1 Conclusion

The objective of this study was to analyse the effect of money supply on the macroeconomic performance of CEMAC countries. To do so, we used the generalized method of moments in system (GMM-system) developed by Arellano and Bover (1995) and Blundell and Bond (1998) over the period 1991 to 2016.

Indeed, most of the work so far devoted to the analysis of macroeconomic performance in the countries of the Union has focused much more on interest rates as the preferred instrument. Moreover, our present work directly analyses the effect of a change in the money supply on economic growth, inflation, employment and investment in the CEMAC countries. Estimates of the four equations using GMM in dynamic panel system revealed mixed results overall.

Several key findings emerge from this research. First, the growth rate of the money supply has a statistically significant effect on the rate of economic growth in the sub-region. Second, money supply growth has a significantly positive influence on the level of inflation in CEMAC countries. Thirdly, the money supply has a positive effect on employment, so monetary policy is not neutral in the CEMAC zone; rather, it should be better exploited. And fourthly, investment is the engine of economic growth in the countries of the sub-region. In the light of our results, the money supply has a positive and significant impact on the latter both in the short term and in the long term on the data for the sub-region as a whole.

5.2 Implications

In view of the results obtained, a number of economic policy recommendations seem to be necessary for CEMAC countries to improve their macroeconomic performance. Thus, it is important for the monetary authorities of CEMAC to make a good trade-off between the objective pursued and the appropriate instrument(s). Referring to our results, it can be said that in order to achieve the objective of price stability, it is necessary to focus on the active use of the money market rate (MMR) to regulate liquidity within the Union; improve the effectiveness of the BEAC's monetary policy through a very good management of economic information in order to eliminate certain problems linked to information asymmetries, but also through greater independence of the issuing institution in the management of its monetary policy further strengthen banking supervision, with particular emphasis on strengthening the supervision and organisation of banking activity within the Community redefine the banking system in order to adapt it to financial globalisation; The authorities should review banking standards and regulations and take measures to increase sanctions for anti-competitive practices

by banks; further develop microfinance within the Union, which could lead to the economic and financial development of CEMAC countries. Indeed, the monetary authorities should also focus on fiscal policy alongside BEAC's monetary policy. Thus, they should:

✓ Encourage domestic production to the detriment of imports, particularly with regard to certain basic products. This will indeed make it possible to reduce imported inflation, which is in fact the main explanatory factor in all Central African countries;

✓ Improve national tax policy in order to obtain the consent of taxpayers to pay taxes and reduce tax evasion and invasion, to encourage both domestic and foreign investors to mobilize funds for financing the economy in the various countries of the sub-region. In addition to these economic policy imperatives, other issues arise at the level of CEMAC, namely:

✓ How can the BEAC's monetary policy be made more effective in a context marked by the emergence of the New Information and Communication Technologies (NICT), which are changing the form of means of payment from day to day?

✓ How to develop inter-bank electronic banking within the community to better facilitate, identify and improve monetary transactions? Not forgetting the Microfinance Institutions (MFIs) that make up a large part of our current financial system.

Since a study such as ours cannot claim to be exhaustive, we cannot conclude without mentioning the limits of this research work and the lines of future research. Indeed, this work would have been better if we had integrated the specificities of each country in the sample into our analysis. Given the specific characteristics of each of the countries in the sample, the results could be different from one country to another. Moreover, future research on the subject could focus on the effect of monetary policy on other macroeconomic variables that we did not consider in this study, such as the speed of money circulation, consumption, poverty levels, national savings, human capital, and the quality of institutions in the countries of the sub-region (CEMAC).

Thus, we also note that the decision taken by the Heads of State of the CEMAC zone in December 2016 may potentially undermine the effectiveness of the restrictive monetary policy conducted by the BEAC since the beginning of 2017 to defend the external monetary stability of the sub-region compared to the current context. States should therefore consider further diversifying their economies in order to develop local productive structures and gradually replace imports that consume foreign exchange reserves, including the advent of Corona Virus (COVID-19) which could have adverse effects on the economies of the CEMAC sub-region.

REFERENCES

[1] Africa Development Indicators (2017), "World Bank database".

[2] Akerlof, G. A. etYellen, J. L. (1985), « A Near-Rational Model of the Business Cycle, with Wage and Price Inertia », *Quarterly Journal of Economics*, supplement.

[3] Amadou Bobbo (2016), "Régime de change et cyclicité budgétaire dans les pays africains", l'actualité économique, revue d'analyse économique, vol. n°3.

[4] Arellano M. (1989), « A note on the Anderson-Hsiao estimation for panel data », economic letters, n°31, pp. 337-341.

[5] Arellano M. et Bond S. (1991), « Some tests of specification for panel data: Monte-Carlo evidence and application to employment equations», Review of economic studies, vol. 58, n°2 pp. 277-297.

[6] Arellano M. etBover O. (1995), « Another look at the instrumental variable estimation of error- compnents models», Journal of Econometrics, vol. 68, issue1, july, pp. 29-51.

[7] Beitone A et al (2008): "Dictionnaire des Sciences Economiques", 2nd ed, www.armandcolin.com, pp. 329-330.

[8] Bernanke B. etMihov (1995): «Mesuring monetary policy», Federal reserve Bank of San Francisco working paper, pp. 95-09.

[9] Berg, A., Charry, L., & Portillo, R. (2013), "*the Monetary Transmission Mechanism inthe Tropics: A Narrative Approach*" (IMF Working Paper No. WP/13/197). International Monetary Fund.

[10] Bikai and Essiane (2018), "Monetary policy, monetary stability and economic growth in CEMAC: a Bayesian SVAR approach", BEAC, Research Directorate.

[11] Bikai J.L. and Kenkouo G.A. (2015), "Analysis and evaluation of monetary policy transmission channels in the CEMAC: an SVAR and SPVAR approach", BEAC Working Paper BWP n° 02/15 January.

[12] Blundell R. et Bond S. (1998), «Initial Conditions and Moment Restrictions in Dynamic Panel Data Models», Journal of Econometrics, Vol. 87, No. 1, pp. 115-143.

[13] Buigut, S. (2009), "Monetary Policy Transmission Mechanism: Implications for the proposed East African Community (EAC) Monetary Union". Presented at the CSAE Conference. Canova, F. (2007). Methods for Applied Macroeconomic Research. Princeton University Press.

[14] Campell T. S. (l978), «Monetary policy and bank portfolio composition: An analysis of their impact on GDP », *Journal of Money, Credit and Banking,* Vol n°(2), (May), pp. 239- 251.

[15] Cheng, K. C. (2006), "*A VAR Analysis of Kenya's Monetary Policy Transmission Mechanism: How Does the Central Bank's REPO Rate Affect the Economy?*" (IMF Working Paper No. WP/06/300). International Monetary Fund.

[16] Davoodi, H. R., Dixit, S., & Pinter, G. (2013), "*Monetary Transmission Mechanism in theEast African Community: An Empirical Investigation*" (IMF Working Paper No. WP/13/39).International Monetary Fund.

[17] Dimitrijevic, B., & Louvre, I. (2013), "Essay on Monetary Policy and Economic Growth" *Journal of Central Banking Theory and Practice*, *1*, 111–138. Estrella, A. (2015). The Price

[18] Puzzle and VAR Identification. *Macroeconomic Dynamics*, *19*, 1880–1887.

[19] Douzounet M. (2007), "Réformes monétaires et croissance économique en zone CEMAC", Journal of Economic Literature.

[20] Fisher S. (1993), «The Role of Macroeconomic Factors in Growth", Journal of Monetary.

[21] FoudaEkobena S.Y. (2013), " Politique monétaire et croissance économique en zone CEMAC : Une approche en données de panel ", October, Faculté de Sciences Economiques et de

[22] Gestion, Université de Yaoundé 2, CAMEROON. Laboratoire d'Analyse et de Recherche en Economie Appliquée (LAREA), Email: kockfouda@yahoo.fr.

[23] Friedman, M. (1956), « The Quantity Theory of Money: A Restatement », in Studies in the Quantity theory of Money, ed. M. Friedman, *Chicago University Press*.

[24] Friedman M. (1968), « The role of monetary policy », in American Economic Review, vol.58 n°1 mars, pp.1-17.

[25] Friedman M. (1976), « Nobel lectures inflation and unemployment », journal of political Economy, vol.85 june, pp.451-472.

[26] Gertler M. et Gilchrist S. (1993), «The raie of credit market imperfections in monetary transmission mechanism: Arguments and evidence», *Scandinavian Journal of Economies,* Vol.95, pp 43-63.

[27] Gordon et al. (1983), «Rules, Discretion and Reputation in a Model ofMonetary Policy », *NBER Working Paper* n° 1079.

[28] Im K.S., Pesaran M.H. et Shin Y. (2003), «Testing for unit roots in heterogeneous panels, Journal of Econometrics, vol. 115, n°1, pp 53-74.

[29] Jayati G. (2007) "Macroeconomic and growth policies, an application to five OECD countries" Centre for Economic Studies and Planning School of Social Sciences Jawaharlal Nehru University New Delhi, India.

[30] Judd F. et Rudebush (1998), «Taylors Rule and the Fed», *Economic Review, Federal Reserve Bank of San Fransisco,* n°3 pp. 3-14.

[31] Kahn M. et Knight M. (1991), «Stabilization Programs in Developing Countries: A Formal Framework», in Kahn M., Montiel P., Haque N. éd «Macroeconomic Models for Adjustment in Developing Countries», IMF, Washington D.C., pp. 38-85.

[32] Keynes, J. M. (1936), *Théorie générale de l'emploi, de l'intérêt et de la monnaie, ed. Payot, Paris.*

[33] Keungne K.L. and Ousman A. M. (2014), "Croissance monétaire, Croissance réelle et Inflation

[34] dans l'Union Monétaire d'Afrique Centrale: Quelques évidences empiriques", BEAC WorkingPaper (BWP), No. 03/15 November.

[35] King M. (2002), «No money, no inflation-the role of money in the economy», Bank of England, Quarterly bulletin, été 2002.

[36] Krause S. (2003), «Measuring monetary Policy Efficiency in European Union countries:

[37] Levine R. etLoayza N. (1999), «Finance and the sources of growth», Word bank, working paper, june.

[38] Levy M. (1998), «Monetary policy stability, disinflation and economic performance», *Nations Banc Montgomery Securities Shadow Open Market Committee,* (September).

[39] Lucas, R. Jr (1972),"Econometric Test of Natural Rate Hypothesis", in *The Econometric of Price Determination*, Board of Governors of Federal Reserve System.

[40] Lucas R. E. (1988), «On the mechanisms of economic development », Journal of Monetary Economics, n°22, pp. 3- 42.

[41] Mallaye D. (2009), " Réformes monétaires et croissance économique en zone CEMAC ", MPRA Paper n°19621, posted 28, December,University of Yaoundé IISoa. Online at http://mpra.ub.uni-muenchen.de/19621.

[42] Mankiw G. (2003), "*Macroeconomics",* 2nd edition, translation of the American edition by Jean Houard.

[43] Mankiw, N. G. (1985), « Small menu costs and large business cycles: a macroeconomicmodel of monopoly », *Quarterly Journal of Economics*, may.

[44] Mantsie R. W. (2003), "inflation and growth in CEMAC countries". UniversitéMarienNgouabi, Brazzaville-Congo.

[45] Mishkin F. (2010), « The Economics of Money, Banking and Financial Markets», 9ᵉéd University of Columbia (Etats-Unies), pp. 76-84.

[46] Mishra, P., Montiel, P., &Sengupta, R. (2016), « *Monetary Transmission in Developing Countries: Evidence from India*».(IMF WorkingPaper No. WP/16/167). International MonetaryFund.

[47] Mouhoubi S. (1991), "Rôle de la politique monétaire dans un contexte d'ajustement économique" *Revue Financière du CAEM* vol 12 n°1, pp. 1-13.

[48] Mounkala, USA. (2013), "*Estimating the demand for money in CEMAC*". (BEACWorkingPaper No. BWP N°01/15). Bank of Central African States.

[49] Mundell, R. A. (1968). « *Man and Economics: The Science of Choice*». McGraw-Hill Company.

[50] Ngerebo-A, T. A. (2016), "Monetary Policy and Inflation in Nigeria". *International Journal of Finance and Accounting*, *5*(2), 67–76.

[51] Nubukpo K. (2007), "L'efficacité de la politique monétaire en situation d'incertitude et d'extraversion: le cas de l'Union Economique et Monétaire Ouest Africaine (UEMOA)", the European journal of developmentResearch, Volume 19, Issue 3, pp. 480-495.

[52] Ondo Ossa A. (2005), " Effets anti-keynésiens et Ajustement (le cas de la zone CEMAC) ", *Economie et Gestion,* n° spécial, pp. 22-78.

[53] Orphanides A. (2002), «Monetary policy IU les and Great Inflation», *Board of Government of' the Federal Reserve System* (January).

[54] Phelps E. (1968), «Money Wage Dynamics and Labor Market Equilibrium», Journal of Political Economy, August, pp. 678-711.

[55] Phillips A. W. (1958), « The Relationship between Unemployment and the Rate of Change of Money Wages in the United Kingdom, 1861-1957», Economica, p. 25.

[56] Pitcher L. Bank of Canada Working Paper 98-17, "Asymmetric Effects of Monetary Policy on Employment," Bank of Canada Working Paper 98-17, September.

[57] Ramsey V. (1993), «How important is the credit channel in transmission of monetary policy? », *CRCS on Public Policy,* Vo1.39, (December), pp 1-46.

[58] Reynard, S. (2007), "Maintaining low inflation: Money, interest rates, and policy stance". *Journal of Monetary Economics*, *54*(5), 1441–1471.

[59] Romer P. (1986), « Increasing returns and Long-Run Growth », Journal of Political Economy, vol. 94, n°5, October, pp.1002-37.

[60] Romer C etRomer D. (1990), «New evidence on the monetary transmission mechanism», *Banking Papers* on *Economic Activity* pp. 149-198.

[61] PREF- CEMAC, (2017), "Programme des Réformes Economiques et Financières de la Communauté Economique et Monétaire des Etats de l'Afrique Centrale".

[62] Saxegaard, M. (2006),«*Excess Liquidity and Effectiveness of Monetary Policy: Evidence from Sub-Saharan Africa*»(IMF Working Paper No. WP/06/115). IMF.

[63] Shari S. (2007), "Macroeconomic and Growth Policy", United Nations, Department of Economic and Social Affairs, June.

[64] Sims, C. (1992), "*Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy",* (Cowles Foundation Discussion Paper No. 1011).

[65] Svensson, L. E. O. (1997), "Inflation Forecast targeting: Implementing and monitoring"

[66] Solow R. (1956), «A contribution to the theory of economic growth», Quartely Journal of Economics, n°70, pp. 5-94.

[67] Stiglitz, J. E. (1987), «The Causes and Consequences of the Dependency of Quality onPrices », *Journal of Economic Literature*, March.

[68] Stiglitz, J. E. (1984), «Price Rigidities and Market Structure », *American Economic Review*,May.

[69] Taylor J. B. (l993), «Discretion Versus Poliey Rules in praetiee». *Carnegie-Rochester Conference Series on public policy,* vol. 39, pp 195-214.

[70] Uanguta E et S. Ikhide (2002), «Monetary poliey transmission meehanism 111 Namibia», *BON Working Paper* N° 2/02, (November), 18p.www.beac.org.

ABOUT AUTHOR

Ulrich Vianney Elisée KAGUENDO is a doctoral student at the Dschang School of Economics And Management in the University of Dschang, Researcher-Assistant at the Laboratoire de Recherche en Economie Fondamentale et Appliquée (LAREFA). University of Bangui;

Appendix 1

Table 1: Variable abbreviations and summary of expected signs

Variables	Data	Code	Measures	Expected signs
Endogenous variables	Actual Gross Domestic Product	TPIBR	Annual growth rate of real GDP per capita	inapplicable
	Inflation	TINFL	Annual growth rate of the Consumer Price Index (IPCONS)	inapplicable
	Employment	EMP	Employment-to-population ratio, persons aged 15 and over	inapplicable
	Investment	INVEST	Gross Fixed Capital Formation	inapplicable
Explanatory variable of interest	Monetary Mass	M2	Currency and quasi-currency	+
Explanatory control variables	Interest Rates	TIAO TIPP	Central bank lending rate on the money market	-
	Public Expenditure	DPUB	Annual growth rate of public expenditure	+
	ExternalReserves	RESEXT	Reserves (including gold), which are measured by annual growth rate of total reserves	+/-
	Exterioropening (commercial opening)	OUVEXT	Annual ratio of export volumes to currency inflows (trade openness calculated by the ratio (Exports+Imports)/GDP)	+/-
	Population Growth Rate	TPOP	Population growth rate	+
	Foreign Direct Investment	IDE	Expressed as a percentage of GDP.	+
	Credit to the Economy	EC	Annual growth rate of credit to the economy	+
	The exchange rate	TCHR	To measure the equilibrium exchange rate, we have used the real exchange rate	+

Source: Author construction.

ANNEXES

Appendix 1: Summary of Unit Root Test Results

Variables	Im-Pesaran-Shin			Decisions
	Value of the statistic	Probability	ThresholdSignificance	
TPIBR	-4.8212	0.0000	1%	I (0)
TINFL	-1.4653	0.0714	10%	I (0)
EMPL	-5.2994	0.0000	1%	I (1)
INVEST	-1.5865	0.0563	10%	I (0)
M2	-1.9696	0.0244	5%	I (0)
TI	-3.6393	0.0001	1%	I (0)
DPUB	-2.0063	0.0224	5%	I (0)
RESEXT	-1.6335	0.0512	10%	I (0)
OUVEXT	-3.0521	0.0011	1%	I (0)
TPOP	-7.7279	0.0000	1%	I (0)
FDI	-1.6912	0.0454	5%	I (0)
EC	-1.7592	0.0393	5%	I (0)
TCHR	-1.8731	0.0305	5%	I (0)

Source: Author based on the results of the stationarity test.

Annex 2: Homogeneity test

Correlation matrix of residuals:

	c1	c2	c3	c4	c5	c6
r1	1.0000					
r2	- 1.0000					
r3	0.2619	0.0424	1.0000			
r4	0.1174	0.1922	0.0937	1.0000		
r5	0.0045	0.2557	0.1017	0.1862	1.0000	
r6	0.0360	0.2203	0.0636	0.0254	0.1868	1.0000

Pesaran's test of cross sectional independence = -0.517, Pr = 0.6054