Science, Education and Innovations in the Context of Modern Problems
Issue 2, Vol. 9, 2026

RESEARCH ARTICLE

The Measurement and Effectiveness of the Credit Channel as a Monetary Policy Transmission Mechanism in the CEMAC Zone: A Post-Keynesian Analysis of Production Financing in a Monetary Union

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Issue web link https://imcra-az.org/archive/392-science-education-and-innovations-in-the-context-of-modern-problems-issue-2-vol-9-2026.html

Keywords Credit channel; Monetary policy transmission; Production financing; Post-Keynesian economics; Bank credit; CEMAC Zone; Monetary union; Central Bank of Central African States (BEAC); Productive investment; Developing economies.

Abstract

This study examines the role, effectiveness, and measurement of the credit channel as a monetary policy transmission mechanism in the Central African Economic and Monetary Community (CEMAC). While conventional analyses of monetary policy in developing economies often emphasize interest rate and exchange rate channels, this paper argues that such approaches overlook the structural importance of bank credit in financing productive investment. In the CEMAC Zone, persistent credit rationing, weak financial intermediation, and institutional constraints have limited the capacity of monetary policy to stimulate real economic activity, particularly in the productive sector. Drawing on post-Keynesian monetary theory and the Keynesian circuit approach, the study conceptualizes credit not as a passive by-product of monetary policy, but as an active and endogenous instrument capable of initiating and sustaining production. The analysis highlights how the historical evolution of the CEMAC financial system, the legacy of monetary cooperation agreements, the abandonment of direct credit controls, and the restrictive stance of the regional central bank (BEAC) have collectively weakened the transmission of monetary policy to investment and growth. Methodologically, the paper proposes a framework for measuring the credit channel that captures both quantitative and qualitative dimensions of bank lending, including credit allocation, sectoral orientation, and financing constraints faced by firms—particularly small and medium-sized enterprises. By situating the analysis within a monetary union context, the study also addresses the limits of policy autonomy and the challenges of conducting development-oriented monetary policy under institutional rigidities. The findings suggest that the marginal role assigned to credit in current monetary frameworks contributes to the underfinancing of productive activities and the persistence of low growth in the region. The paper concludes by advocating a shift toward a production-oriented monetary policy, grounded in the currency–credit–production nexus, in which the central bank plays a proactive role in steering credit toward growth-enhancing sectors. This reconceptualization has important implications for monetary governance, financial reform, and economic development strategies in the CEMAC Zone and other developing monetary unions.

Citation

Jean Luis Ekomane; Benjamin Yamb. (2026). The Measurement and Effectiveness of the Credit Channel as a Monetary Policy Transmission Mechanism in the CEMAC Zone: A Post-Keynesian Analysis of Production Financing in a Monetary Union. *Science, Education and Innovations in the Context of Modern Problems*, 9(2), 1-20. https://doi.org/10.56334/sei/9.2.57

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Received: 14.04.2025	Accepted: 09.12.2025	Published: 22.01.2026 (available online)

1. Introduction

The economic strength and resilience of modern nations are fundamentally determined by their capacity to produce more efficiently, more sustainably, and with higher value added. At the core of this productive capacity lies the issue of financing productive investment, which constitutes a categorical imperative for both private economic agents and public policymakers. In this context, the allocation and distribution of credit play a decisive role in shaping the conditions under which investment, innovation, and long-term growth can emerge. An efficient credit system is therefore not merely a financial mechanism, but a structural prerequisite for the establishment of a viable and growth-enhancing productive sphere.

This observation is particularly relevant for African economies, where the effectiveness of monetary policy in supporting real economic activity remains a subject of intense debate. The present study highlights the central importance of monetary variables, especially bank credit, in the formulation and implementation of economic policy aimed at ensuring the sustainability and structural transformation of economies within the Central African Economic and Monetary Community (CEMAC).

Historical evidence demonstrates that the financing of productive activities in most advanced economies was largely facilitated by a dynamic expansion of bank credit, notably during the Industrial Revolution. Banks played an active role in channeling savings toward industrial investment, thereby fostering capital accumulation and technological progress. In more recent times, the lessons drawn from the 2007–2010 global financial crisis have further reinforced the importance of credit in the transmission of monetary policy. This crisis led to the adoption of unconventional monetary instruments, particularly in developed economies, where traditional policy tools proved insufficient to revive economic activity.

In response, central banks in countries such as Japan, the United States, and—albeit to a lesser extent—the European Union implemented expansionary policies commonly referred to as quantitative easing or credit easing. These policies aimed explicitly at stimulating bank lending and improving financing conditions for the real economy. As emphasized by Artus (2014), such mechanisms represent a profound transformation in the conduct of monetary policy, while Stiglitz (2013) characterizes them as a genuine revolution in macroeconomic governance. These experiences offer valuable lessons for developing countries, particularly those of the CEMAC Zone, where access to productive financing remains severely constrained.

The renewed emphasis on credit supply recognizes that monetary policy exerts its influence not only through interest rates, but also through the availability and allocation of bank credit. In this framework, central bank intervention places credit at the heart of economic regulation. However, this evolving context also reveals the limitations of conventional monetary policy instruments. As noted by Artus and Broyer (2014), traditional tools often fail to ensure effective transmission to the productive sector, especially in economies characterized by structural rigidities and underdeveloped financial markets.

In developing countries, the difficulty of accessing finance has been formally identified as one of the most significant obstacles to business activity. This constraint disproportionately affects small and medium-sized enterprises (SMEs), which are generally more vulnerable to credit rationing due to informational asymmetries, insufficient collateral, and higher perceived risk (UNO, 2005). Consequently, the limited effectiveness of monetary policy transmission raises critical concerns regarding economic growth and employment generation in these economies.

The relevance of studying the credit channel in the CEMAC Zone is further reinforced by several structural and institutional factors. First, the post-colonial financial system of the region—despite undergoing superficial reforms—continues to favor short-term commercial activities rather than long-term productive investment. Second, the monetary cooperation agreements signed in 1972 between the French Treasury and CEMAC member states have significantly constrained the monetary sovereignty of the Bank of Central African States (BEAC), as highlighted by Guillaumont and Guillaumont (1984). These arrangements limit the central bank's capacity to conduct an autonomous and development-oriented monetary policy. Moreover, the collapse of several development-oriented financial institutions following the economic crises of the 1980s severely weakened the region's capacity to finance long-term investment. Commercial banks that survived this period—or were created during subsequent financial restructuring—have since adopted a highly cautious approach to lending. This behavior is further reinforced by the restrictive monetary stance of the BEAC. The financial liberalization reforms of the 1990s, which led to the abandonment of direct credit control instruments in favor of indirect market-based tools, further reduced the capacity of public authorities to steer credit toward strategic growth sectors.

Notably, economic growth objectives are neither explicitly embedded in the statutes of the BEAC nor in the Convention governing the Central African Monetary Union (UMAC). This institutional omission reflects a broader neglect of productive financing within the regional monetary framework. Consequently, alternative sources of development financing—such as public aid to development, foreign direct investment, external debt, and initiatives targeting heavily indebted poor countries—have produced limited or disappointing results (Ngango, 1967; Sogge, 2003).

In light of these shortcomings, public authorities traditionally rely on two major economic policy instruments to stimulate economic activity: fiscal policy and monetary policy. While fiscal policy often suffers from implementation delays and political constraints, monetary policy offers greater flexibility and responsiveness. As emphasized by Mishkin (2010), monetary policy can influence financing conditions and correct credit market imperfections, making it a potentially powerful tool for fostering investment and growth.

Despite this potential, existing empirical studies have often treated monetary transmission channels—particularly the credit channel—as passive and incidental mechanisms. In such analyses, credit is viewed merely as a byproduct of interest rate changes rather than as an autonomous driver of productive investment. This perspective underestimates the strategic role that credit allocation can play in development-oriented monetary policy.

Against this background, the present study advances both a theoretical and empirical contribution. Theoretically, it revisits and extends the Keynesian circuit theory and the post-Keynesian monetary economy of production, which emphasize the central role of bank credit in initiating and sustaining the production process. These approaches are particularly relevant in the context of developing economies characterized by incomplete and imperfect financial markets. The recurrence of financial crises has further underscored the relevance of these frameworks, contributing to what many scholars describe as the "resurrection of Keynes."

Beyond theoretical renewal, this study proposes an extension of monetary thought by reconceptualizing the credit channel as an active policy instrument, rather than a passive transmission mechanism. In doing so, it advocates a shift from a post-Keynesian "monetary economy of production" toward a "production-oriented monetary policy". Such a policy framework is built upon the currency–credit–production triptych and aims explicitly at promoting sustainable economic growth through targeted credit allocation under the leadership of the central bank.

Empirical Motivation and Policy Relevance

Empirically, bank credit remains a cornerstone of corporate finance in developing economies, particularly in contexts where capital markets are either absent, shallow, or institutionally weak. Firms in such economies represent major engines of employment creation, value added, and fiscal capacity; yet they typically operate in environments where equity and bond financing are structurally limited. Even when stock exchanges formally exist, access to market-based financing instruments (equities and corporate bonds) remains restricted to a small segment of large firms. Small and Medium-sized Enterprises (SMEs)—and even more so Very Small Enterprises (VSEs)—are effectively excluded from these channels due to high listing costs, stringent disclosure requirements, low investor appetite, and persistent information asymmetries. Consequently, bank credit constitutes not only the dominant, but often the only feasible external financing source for the majority of firms.

Within this framework, a systematic investigation of the credit channel in the BEAC Zone is particularly valuable because it enables the identification of financial system dysfunctions and structural bottlenecks, while also clarifying the nature of the region's financial architecture—specifically, the relative shares and complementarities of bank-based versus market-based financing (Pollin & Vaubourg, 1998). Such a study therefore contributes to diagnosing whether the financial system's configuration is optimal for financing long-term productive investment and supporting structural transformation.

The question of credit-channel effectiveness is further reinforced by recent international developments. Successive global financial disturbances and structural mutations in banking and monetary governance have driven renewed scholarly and policy attention to the evolving role of central banks, as well as to the most appropriate financing models for different economies. In this regard, contemporary debates surrounding the strategies of the Federal Reserve (FR) and the European Central Bank (ECB)—particularly their contrasting approaches to growth support and credit stimulation—provide an instructive backdrop and enhance the relevance of this study.

Lessons from the Global Financial Crisis and the African Transmission Challenge

The 2007–2010 global financial crisis generated renewed attention to monetary policy transmission by demonstrating that conventional mechanisms can become dysfunctional, particularly when the financial system experiences disruptions or liquidity traps. In such circumstances, the blocking or weakening of transmission channels revitalizes the debate on how best to finance economic activity, with special emphasis on the credit channel (Artus, 2014). Consequently, central banks have increasingly sought to "repair" impaired transmission mechanisms and reactivate lending to the real sector (Marchal, 2013).

For developing countries—and especially those of the CEMAC Zone—this debate is not only theoretical. After the mitigated outcomes of Structural Adjustment Programmes (SAPs) and the burden of unsustainable external debt dynamics, these countries have increasingly embraced ambitious objectives of accelerated growth aimed at economic emergence and poverty reduction. Achieving such objectives requires the mobilization of all available policy instruments, including monetary policy, provided that its transmission to the real economy is effective and not structurally blocked.

More broadly, the capacity to design and implement monetary policy depends critically on ensuring that policy impulses are actually transmitted to investment, production, and employment. This remains an acute challenge across Africa, where monetary policy transmission is frequently weak, delayed, or fragmented due to structural characteristics of banking systems, shallow financial markets, and institutional constraints (IMF, 2014). Within the CEMAC Zone, improving mastery of the credit channel could support not only higher growth rates, but also the consolidation of the productive base, increased

private investment, and economic diversification—prerequisites for meaningful integration into an increasingly competitive global economy.

Objectives, Approach, and Empirical Strategy

Against this background, the central objective of this study is to assess the transmission of monetary policy in the CEMAC Zone through the credit channel. To achieve this objective, the paper proceeds in three main stages.

First, it presents the principal monetary policy transmission channels commonly identified in the literature—namely the interest rate channel, asset price channels, and the credit channel—while evaluating their relevance in the institutional and structural context of the CEMAC monetary union. This discussion makes it possible to determine which channel appears most appropriate for understanding the transmission of BEAC monetary policy.

Second, the study empirically evaluates the selected mechanism by measuring key operational parameters of the credit channel, including its width, depth, speed, and transmission lag (time). The empirical strategy relies on causality tests and Vector Autoregressive (VAR) modeling to examine the direction and intensity of dynamic interactions between monetary variables, banking credit, and real-sector outcomes.

Third, based on empirical findings, the study formulates policy recommendations aimed at strengthening the efficiency of monetary transmission and improving the allocation of credit toward productive sectors in the region.

2. Monetary Policy Transmission Channels: A Brief Literature Review

The economic literature identifies a broad range of monetary policy transmission channels. In a simplified classification, these mechanisms can be grouped into three major categories: (i) the interest rate channel, (ii) the channel of other asset prices (including stocks, bonds, exchange rates, and real estate prices), and (iii) the credit channel (Mishkin, 1996). The relevance of each channel depends not only on monetary policy design but also on the structural features of the financial system.

In Central Africa, the financial system remains overwhelmingly bank-dominated, with market financing playing a marginal role. This configuration makes the credit channel particularly relevant, as the effectiveness of monetary policy largely depends on the ability of the monetary authority to influence bank credit conditions and thereby affect investment and output in the real economy. In an environment lacking deep and efficient capital markets, the key question becomes whether monetary policy can effectively shape banks' credit supply decisions so as to stimulate the financing of growth-generating productive activity.

Effective monetary transmission contributes to ensuring that monetary and credit aggregates evolve consistently with potential output growth, thereby supporting macroeconomic objectives such as employment, price stability, and sustainable financing conditions (Mishkin et al., 2010). Yet the practical implementation of monetary policy lies at the intersection of "science" and the central bank's "art," requiring informed decision-making that encourages commercial banks to provide sufficient liquidity and allocate credit efficiently (Bordes, 2007).

Furthermore, currency demand should not be interpreted solely through the traditional motives of transaction, precaution, and speculation. Within a production-centered perspective, money is also demanded for a financing motive, referring to the advance provision of liquidity required to implement investment decisions and initiate production. In such a framework, credit creation becomes central: banks create money through lending, firms invest and produce, and output subsequently validates the initial expansion of money. Money is thus understood as credit money, representing an ex ante anticipation of future production.

In addition, structural characteristics such as information asymmetries, nominal rigidities, and hysteresis effects contribute to financial market incompleteness and, in some cases, market failure. These features strengthen the relevance of active monetary policy and enhance the potential importance of credit-based transmission (Pollin, 1999). In parallel, several strands of research—often critical of monetarist assumptions—have increasingly placed production financing and credit dynamics at the center of macroeconomic analysis (Artus, 2014; Kaldor, 1985; Taylor, 1995; Blanchard & Galí, 2007). Ireland (2004), for instance, argues that money can be integrated into business cycle analysis precisely because credit supply plays a decisive role in financing real activity.

In this perspective, banks are not merely intermediaries; they are institutions with a unique function of liquidity creation and distribution, which makes them pivotal in the financing process (Kashyap et al., 2002). This is precisely why the present study emphasizes the credit channel: alternative channels—particularly those based on interest rates and asset prices—often fail to satisfy the operational conditions required for effective transmission in the CEMAC context.

2.1. Limits to Other Monetary Policy Transmission Channels in the CEMAC Zone

The focus on the credit channel is further justified by the structural and institutional constraints that limit the effectiveness of the other two main transmission mechanisms: the interest rate channel and asset price channels.

2.1.1. The Limited Scope of the Interest Rate Channel

The traditional Keynesian interest rate channel, commonly formalized through the IS–LM framework, suggests that an expansionary monetary policy increases money supply, reduces interest rates, stimulates investment, and ultimately raises

output. In practice, this chain of transmission presupposes (i) that policy actions significantly affect market interest rates and (ii) that private investment responds elastically to interest rate changes.

However, these conditions are not necessarily satisfied in the CEMAC Zone. Historically, interest rates were administratively controlled until liberalization reforms around 1990. After liberalization, lending rates became subject to negotiation between banks and borrowers. Yet in such a context, interest rates often reflect banks' discretionary pricing—based on perceived borrower risk, collateral availability, and bargaining power—rather than the direct influence of central bank policy. As a result, changes in observed lending rates may be weakly linked to BEAC policy signals.

Moreover, evidence from advanced economies also suggests that interest-rate mechanisms may lose effectiveness under certain conditions. Artus (2014), drawing on Euro Area dynamics, argues that monetary policy implemented primarily through interest rates no longer transmits effectively in a number of contexts. Additionally, Bernanke and Gertler (1995) emphasize that empirical research often struggles to identify a strong investment response to interest rate variations through the capital cost channel. This analytical limitation has encouraged scholars to explore alternative transmission mechanisms, particularly the credit channel (Mishkin, 1996). Indeed, even within the theoretical relationship between interest rate $i$and investment I, the elasticity of investment with respect to interest rate is not guaranteed—reinforcing the case for analyzing credit supply behavior.

2.1.2. Structural Constraints on Asset Price Channels: Exchange Rate and Tobin's q

Beyond interest rates, monetary policy may also transmit through asset prices—most notably exchange rates and equity prices—an approach highlighted in the literature associated with Meltzer (1995) and earlier contributions by Modigliani (1971).

2.1.2.1. The Exchange Rate Channel and Its Institutional Blockage

In theory, the exchange rate channel suggests that a decrease in domestic real interest rates reduces the attractiveness of domestic currency-denominated deposits relative to foreign currency assets, leading to currency depreciation. Depreciation then improves export competitiveness and raises net exports, thereby stimulating output.

Yet this mechanism is structurally constrained in the CEMAC Zone due to the fixed exchange rate regime anchored in monetary cooperation arrangements with France. Unlike many countries that shifted toward more flexible exchange rate regimes during the 1980s, CEMAC member states maintained a fixed parity, which implies that exchange rate adjustment cannot operate as a regular transmission mechanism. Consequently, this channel is institutionally "blocked," and monetary policy cannot reliably stimulate economic activity through exchange rate movements.

This institutional arrangement also raises the classic issue of policy inconsistency associated with the "impossible trinity": an economy cannot simultaneously maintain a fixed exchange rate regime, full capital mobility, and an independent monetary policy. Under these constraints, the space for autonomous monetary action becomes limited.

2.1.2.2. The Weak Role of Equity Prices and Tobin's q

Monetary policy may also influence investment through equity markets by affecting firms' market valuations and the Tobin's $q$ratio. Defined as the ratio between a firm's market value and the replacement cost of its capital stock, Tobin's $q$suggests that higher equity prices make investment more attractive. Expansionary monetary policy can raise equity prices, increase q, and stimulate investment and output.

However, the relevance of this channel is extremely limited in the CEMAC Zone because equity markets are underdeveloped and illiquid. The small number of listed firms, low trading volumes, and limited investor participation imply that stock prices cannot function as a broad macroeconomic transmission mechanism. For example, the limited listing activity in the Douala Stock Exchange, and the still modest development of the Central Africa Stock Exchange (BVMAC) in Libreville, reduce the plausibility of meaningful Tobin's q-based transmission. In such conditions, monetary policy cannot depend on equity price movements to influence productive investment.

2.2. Wealth Effects and the Limited Role of the Stock Price Channel in the CEMAC Zone

Beyond its influence on investment, the stock price channel may also affect economic activity through wealth effects on consumption. This mechanism was first formalized by Modigliani (1971) within the framework of the life-cycle hypothesis, which posits that consumption decisions are determined by individuals' expected lifetime resources rather than by current income alone. These resources consist of three principal components: human capital, physical capital, and financial wealth. Within this framework, equity holdings constitute a central element of financial wealth.

An increase in stock prices raises the market value of households' financial assets, thereby expanding perceived lifetime resources and encouraging higher consumption expenditures. Through this channel, expansionary monetary policy—by stimulating equity prices—can indirectly boost aggregate demand and output. However, the empirical relevance of this mechanism depends critically on household participation in financial markets and the depth and liquidity of stock exchanges.

In the context of the CEMAC Zone, several structural constraints severely limit the effectiveness of the stock price channel. Household income levels remain relatively low, financial inclusion is limited, and participation in equity markets is marginal. Moreover, financial markets in the region remain embryonic, characterized by low capitalization, limited trading volumes, and weak investor confidence. Small and Medium-sized Enterprises (SMEs), which constitute the backbone of the

productive sector, are largely excluded from equity financing and rarely listed on sub-regional stock exchanges. Consequently, changes in stock prices have a negligible impact on household wealth and consumption behavior.
As a result, the stock price channel cannot serve as an effective transmission mechanism for the monetary policy conducted by the Bank of Central African States (BEAC). Given the structural ineffectiveness of interest rate, exchange rate, and asset price channels, it becomes analytically and empirically appropriate to focus on the credit channel as the primary mechanism through which monetary policy may influence real economic activity in the CEMAC Zone.

2.3. Theoretical Foundations of the Credit Channel

The theoretical justification for the credit channel is grounded in New Keynesian economics, which emphasizes the presence of market imperfections—such as information asymmetries, nominal rigidities, and financial market incompleteness—that prevent the economy from achieving optimal outcomes through market forces alone. Seminal contributions by Akerlof (1970), Stiglitz and Weiss (1981), Mankiw (1986), Greenwald (1995), and Yellen and Romer (1990) converge on two fundamental propositions: first, money is not neutral in the short and medium run; second, financial market imperfections lead to suboptimal credit allocation, thereby justifying public intervention through monetary policy.
Within this framework, the credit channel operates through changes in banks' balance sheets and lending behavior. An expansionary monetary policy—by increasing reserves and deposits—enhances banks' capacity to extend loans. The resulting increase in credit availability stimulates investment and, to a lesser extent, consumption, ultimately leading to higher output and employment (Mishkin et al., 2010). Thus, monetary policy affects real economic activity not merely through prices, but through quantities—specifically, the supply of bank credit.
The literature distinguishes between two variants of the credit channel: the broad credit channel, often referred to as the *financial accelerator*, and the narrow credit channel, also known as the *bank lending channel*. The broad channel emphasizes the role of borrowers' balance sheets and net worth, suggesting that changes in asset values affect borrowing capacity and external finance premiums. In contrast, the narrow channel focuses explicitly on banks' ability and willingness to supply loans, particularly to firms that lack access to alternative financing sources.
The relevance of the credit channel has been reinforced by recent monetary policy debates. Artus and Broyer (2014) argue that, following the 2007–2010 global financial crisis, traditional transmission mechanisms in the Euro Area became largely ineffective, prompting renewed interest in credit-based policy tools. Similar concerns were raised earlier in the United States and Europe (McCallum, 2004; Mishkin, 1994) and later extended to developing economies. Monetary policy can influence real activity by altering both the availability and conditions of bank lending (Lavigne & Villieu, 1996).
Historically, the relationship between finance and growth has long been emphasized. Schumpeter (1911, 1923) viewed financial institutions as essential facilitators of innovation and technological progress. Financial intermediaries, by mobilizing savings and allocating capital, play a decisive role in economic development. This perspective underpins modern analyses of monetary policy transmission, beginning with Tobin and Brainard (1963), who highlighted the role of financial intermediaries in the effectiveness of monetary controls.
Subsequent empirical studies reinforced this view. Romer and Romer (1989) demonstrated that restrictive monetary policy reduces money supply (M2), contracts bank credit, depresses investment, and ultimately slows economic activity. Bernanke and Blinder (1992), as well as Kashyap and Stein (1993), provided empirical evidence of a bank lending channel in the United States, showing that monetary policy significantly affects banks' loan supply. Lavigne and Villieu (1996) further refined the distinction between broad and narrow credit channels and proposed the use of Vector Autoregressive (VAR) models to evaluate their effectiveness.
In the European context, Goux (1996) empirically demonstrated that the parameters of the narrow credit channel—its width, depth, and speed—can be measured. In developing economies, Joseph (1996) documented extensive credit rationing in Cameroon and highlighted the restrictive criteria governing banks' lending decisions.
Studies focusing on the CEMAC Zone reveal persistent structural weaknesses. Despite banking sector restructuring, institutions remain ill-equipped to finance long-term development and face challenges related to globalization and competition (Bekolo-Ebe, 1998; Okah-Atenga, 1998). While more recent evidence suggests improved profitability and excess liquidity in the banking sector (Avom, 2006), the financial system remains highly segmented and largely ineffective in financing productive investment (Hugon, 2007).
Importantly, the credit channel has asymmetric effects across firm sizes. As emphasized by Mishkin et al. (2010), small enterprises are more sensitive to monetary policy shocks because they rely heavily on bank loans, whereas large firms can access capital markets directly. Given that SMEs dominate the productive structure of the CEMAC economies, effective utilization of the credit channel is particularly crucial.

3. Methodological Framework for Assessing the Credit Channel in the CEMAC Zone

Assessing the effectiveness of the credit channel requires quantifying its width, depth, speed, and transmission lag using rigorous econometric techniques. The empirical strategy involves two main stages: (i) preliminary tests required for the

application of Vector Autoregressive (VAR) models—namely stationarity and cointegration tests; and (ii) dynamic analyses using causality tests and VAR estimations to evaluate the transmission mechanism.

VAR models are particularly suited for analyzing monetary policy transmission because they capture the dynamic interrelationships among macroeconomic variables without imposing strong a priori theoretical restrictions (Friedman & Schwartz, 1963; Sims, 1980). The predictive power of VAR models enables the estimation of the direction, magnitude, and duration of monetary shocks on real economic variables, making them valuable tools for policy analysis (Lavigne & Villieu, 1996).

The empirical analysis is conducted using consolidated annual data from the six member countries of the Central African Monetary Union (UMAC). Data sources include the BEAC and the World Bank's African Development Indicators (ADI).

The methodological framework draws on two core economic principles. The first is the theory of monetary targeting, which posits a stable relationship between money supply (M2) and nominal output. Following Feldstein and Stock (1994), nominal GDP is modeled as a function of M2:

$$GDP = f(M2)$$

The second principle builds on Keynesian transmission mechanisms under conditions of information asymmetry, incorporating credit into the IS–LM framework (Bernanke & Blinder, 1988; Mishkin, 1994). Expansionary monetary policy increases bank deposits, expands credit supply, stimulates investment, and ultimately raises output.

Three empirical approaches dominate the literature on monetary transmission: structural models, VAR models, and qualitative policy indicators (Lavigne & Villieu, 1996). This study primarily employs VAR analysis, complemented by qualitative insights, to identify stable and economically meaningful relationships among monetary aggregates and real variables.

Given the central role of money supply in both policy implementation and transmission (Brunner, 1968; McCallum, 2008), M2 is chosen as the primary monetary policy indicator. This choice is consistent with BEAC's policy framework, which emphasizes money supply growth rules based on banks' money creation through the credit multiplier process.

The credit transmission mechanism can be summarized as follows:

$$M2 \uparrow \Rightarrow Credit \uparrow \Rightarrow Investment \uparrow \Rightarrow GDP \uparrow$$

Using VAR analysis, the existence and strength of causal links among these variables are empirically tested through Granger causality tests (1969).

3.1. Mathematical Formulation of the VAR Model

Let Y_t denote a vector of k endogenous variables. A VAR model of order p is defined as:

$$Y_t = a_1 Y_{t-1} + \cdots + a_p Y_{t-p} + \mu + \varepsilon_t (1)$$

When exogenous variables X_t are included, the model becomes:

$$Y_t = a_1 Y_{t-1} + \cdots + a_p Y_{t-p} + b_1 X_{t-1} + \cdots + b_m X_{t-m} + \mu + \varepsilon_t (2)$$

The reduced-form VAR is expressed as:

$$Y_t = A_0 + A_1 Y_{t-1} + \cdots + A_p Y_{t-p} + \eta_t (3)$$

where η_t represents a vector of structural shocks.

The empirical transmission equation is specified as:

$$GDP_t = \beta_0 + \beta_1 M2_t + \beta_2 CRI_{t-i} + \beta_3 CRP_{t-i} + \beta_4 INV_{t-i} + \beta_5 GDP_{t-i} + \varepsilon_t$$

where CRI denotes domestic credit, CRP private sector credit, and i the lag length determined by causality tests.

4. Empirical Findings and Discussion

Table 1 presents the results of stationarity tests conducted on the credit channel variables. All variables—money supply (M2), domestic credit (CRI), private credit (CRP), investment (INV), and GDP—are integrated of order one, $I(1)$, justifying subsequent cointegration and VAR analyses.

Table 1. Stationarity Test Results for Credit Channel Variables in the CEMAC Zone

Variable	M2	CRI	CRP	INV	GDP
Order of integration	I(1)	I(1)	I(1)	I(1)	I(1)

Source: Authors' calculations based on BEAC data and World Bank African Development Indicators (ADI).

Stationarity and Long-Run Relationships Among Credit-Channel Variables

The unit-root (stationarity) tests indicate that all macro-financial series used in the analysis are integrated of order one, I(1). This implies that each variable is non-stationary in levels but becomes stationary after first differencing. Put differently, the level of each variable in a given year is strongly related to its past realizations, reflecting persistence and path dependence in the CEMAC Zone's macro-financial dynamics. In such a configuration, estimating relationships in levels without accounting for non-stationarity could lead to spurious results. At the same time, the fact that all variables share a common integration order supports the possibility of a stable long-run equilibrium relationship, i.e., cointegration, among the principal credit-channel variables.

To test for long-run stability, we employ the Johansen cointegration approach, which is appropriate in a multivariate setting and consistent with the VAR framework adopted in this study. The Johansen test results reported below indicate that the variables M2, CRI, CRP, INV, and GDP exhibit at least one cointegrating relationship at conventional significance levels. This suggests that, although the variables may deviate from equilibrium in the short run due to shocks, they tend to move together over time and adjust toward long-run stability. The existence of cointegration therefore confirms that the specification captures meaningful and persistent economic relationships linking money supply, credit aggregates, investment, and output in the CEMAC Zone (see cointegration test table in the appendix).

Table 2. Johansen Cointegration Test Results

Eigenvalue	Likelihood ratio (LR)	Critical Value (CV) at 5%	Critical Value (CV) at 1%	Number of supposed CE
0.805356	136.4105	87.31	96.58	None **
0.464438	70.94709	62.99	70.05	At most one **
0.418618	45.96958	42.44	48.45	At most two *
0.286021	24.27567	25.32	30.45	At most three
0.236613	10.79961	12.25	16.26	At most four

Note. The stars * (**) indicate rejection of the null hypothesis of no cointegration, implying acceptance of cointegration at 5% (1%). *CE* refers to the number of cointegrating equations.

These results support two important implications for the analysis. First, they reinforce the interpretation that the CEMAC Zone's monetary-credit environment is governed by long-term macro-financial linkages. Second, they validate the use of VAR-based dynamic analysis, since cointegration implies that short-run dynamics and long-run equilibrium must be jointly considered when assessing monetary transmission through credit.

Granger Causality: Identifying Directional Links in the Credit Channel

To examine the direction of influence among the variables, we apply the Granger causality test (Granger, 1988). In this framework, a variable *X* is said to "Granger-cause" *Y* if the inclusion of past values of *X* improves the prediction of *Y* beyond what is achievable using only past values of *Y*. The test is implemented using annual data; therefore, we select one-year and two-year lags to capture plausible transmission delays and maintain compatibility with the subsequent VAR estimations.

Table 3. Granger Bivariate Causality Test

Null hypothesis H_0*: X does not Granger-cause Y*

X/Y	P (1 lag)	P (2 lags)
M2 / CRI	0.05982	0.12558
CRI / M2	0.05823	0.57459
CRI / INV	0.61661	0.02105*
INV / CRI	0.01268	0.00278
INV / GDP	0.47304	0.97928
GDP / INV	0.09469	6.0E-06
M2 / INV	0.46548	0.98577
INV / M2	0.00057	0.00841
CRI / GDP	0.13981	0.82695
GDP / CRI	0.01412	0.00714
M2 / GDP	0.00419*	0.00235*
GDP / M2	5.4E-08	1.4E-06
M2 / CRP	0.40262	0.24444
CRP / M2	0.47402	0.47591
INV / CRP	0.13814	0.62746

X/Y	P (1 lag)	P (2 lags)
CRP / INV	0.03529*	0.07843
CRP / GDP	0.05997	0.20186
GDP / CRP	0.19056	0.03334

Source: Authors' calculations based on BEAC data.

Note: Values are the p-values associated with Fisher's F-tests of coefficient joint significance in the relevant regressions. Low p-values (below 5%)—highlighted by —*suggest rejection of the null hypothesis and support the presence of Granger causality. The star ()* indicates causalities of primary interest for monetary policy transmission.

Interpretation of Key Causalities

Several statistically meaningful causal patterns emerge.

1. Domestic credit and investment (CRI → INV).
   The results indicate that domestic credit (CRI) Granger-causes investment (INV) at the two-year lag with a low error risk (p = 0.02105). This suggests that changes in credit availability precede and help predict changes in investment activity with a delayed effect—consistent with the notion that investment projects require time for preparation, financing approval, and implementation.
2. Private credit and investment (CRP → INV).
   More importantly, private sector credit (CRP) Granger-causes investment (INV) with a one-year lag and a statistically significant risk level (p = 0.03529). This result is crucial because it indicates a faster and more direct transmission from credit to investment when credit is specifically directed to the private sector. In operational terms, this supports the argument that CRP is a more appropriate credit-channel variable than aggregate domestic credit, because it is both more targeted and more responsive in relation to productive investment dynamics.
3. Money supply and output (M2 → GDP).
   Money supply M2 Granger-causes nominal GDP at both one-year and two-year lags (p = 0.00419 and p = 0.00235 respectively). Among these, the one-year relationship is retained as the most policy-relevant and parsimonious. This empirical outcome strongly supports the theoretical position that monetary aggregates can serve as a valid indicator for monetary policy in contexts where credit and money dynamics remain central to real activity. It aligns with classical and modern contributions emphasizing the relevance of money in macroeconomic transmission (Brunner, 1968; McCallum, 2008; Taylor, 1985) and is particularly consistent with Feldstein and Stock (1994), who document a stable relationship between money aggregates and nominal GDP and argue for the usefulness of monetary aggregates as policy indicators.

On the basis of these findings, we retain M2 as the primary indicator of BEAC monetary policy impulses and identify private sector credit (CRP) as the most relevant credit aggregate for tracing the policy transmission path toward investment and production.

4.1. Analysis of Credit Channel Parameters in the CEMAC Zone

Following Mishkin (1996) and related empirical approaches, we interpret the above dynamic relationships through the measurement of key credit-channel parameters: width, outflow/flow (often related to "speed" of transmission from policy to bank lending), and depth (sensitivity of alternative credit aggregates).

4.1.1. Credit Channel Width in the CEMAC Zone

The width of the credit channel refers to the degree to which firms can substitute between bank financing (loans) and market financing (equity and bond issuance). When the channel is wide, borrowers can access credit through multiple sources, implying near-substitutability between bank loans and securities. In that setting, a tightening of bank credit could be partly offset by issuing bonds or raising equity in capital markets. Conversely, when the channel is narrow, firms are structurally dependent on banks, and monetary shocks transmitted through the banking system have larger real effects because alternative financing is unavailable or negligible.

The CEMAC Zone is characterized by a highly bank-dominated financial architecture, indicating that the credit channel is structurally narrow. In practical terms, the overwhelming majority of external financing originates from bank loans, while market financing remains marginal due to shallow capital markets and limited corporate participation. The limited development of sub-regional stock exchanges—namely the BVMAC (Libreville) and the Douala Stock Exchange (Cameroon)—constrains firms' capacity to diversify funding sources. Under such conditions, firms rely almost exclusively on bank credit for external financing, which increases their vulnerability to bank lending constraints and amplifies the macroeconomic effects of credit rationing.

This structural dependence also strengthens the role of the external finance premium. In line with the logic advanced by Bernanke and Gertler (1989), banks may require a higher premium when borrowers possess limited pledgeable wealth relative to external financing needs. Consequently, large and well-collateralized firms tend to be privileged in lending decisions, while SMEs—despite their central role in employment and value creation—face higher costs or outright exclusion. In a narrow financial system, monetary or financial shocks propagate through borrowers' balance sheets and financing conditions, often reinforcing cyclical downturns.

4.1.2. Credit Channel Outflow (Policy-to-Credit Transmission Capacity)

The outflow of the credit channel refers to the central bank's capacity to transmit policy impulses into the banking system in a way that effectively modifies credit supply. Operationally, outflow is evaluated by examining whether the monetary policy indicator (here, M2) Granger-causes credit aggregates (CRI and CRP), and whether VAR impulse responses confirm that bank lending responds to monetary impulses.

In the present results, Granger causality tests do not establish a statistically significant causal link from M2 to CRI or from M2 to CRP at conventional thresholds. This finding suggests that changes in money supply do not systematically precede changes in bank credit aggregates in the CEMAC Zone. Interpreted economically, this indicates a weak policy-to-credit transmission, meaning that BEAC policy actions may not reliably translate into changes in banks' lending behavior.

Such an outcome is consistent with a banking environment where credit supply decisions are dominated by microeconomic considerations—risk assessment, borrower quality, collateral constraints, portfolio preferences, and profitability objectives—rather than by the central bank's monetary impulses. In this context, banks may hold excess liquidity but still refrain from lending to the productive sector due to informational frictions, weak credit infrastructures, or risk-return trade-offs. The result is a low-performing outflow, implying that the credit channel's "policy lever" is not fully operational.

4.1.3. Credit Channel Depth in the CEMAC Zone

The depth of the credit channel refers to the identification of the credit aggregate that is most sensitive and relevant for monetary transmission (Goux, 1996). In other words, among available credit measures, depth seeks to determine which aggregate best reflects the channel through which monetary impulses affect real activity.

In this study, two credit aggregates are assessed: domestic credit (CRI) and private sector credit (CRP). Although Granger causality from M2 to either credit aggregate is not statistically confirmed, additional VAR-based evidence (as stated in your draft) indicates that CRP reacts more strongly than CRI to monetary impulses represented by M2. Moreover, the causality tests show that CRP has a faster and statistically significant causal effect on investment (one-year lag), whereas CRI's influence on investment appears more delayed (two-year lag).

Taken together, these findings support the conclusion that private sector credit (CRP) constitutes the most operationally relevant credit variable for the CEMAC credit channel. It captures credit flows directed toward private productive actors and exhibits quicker linkage to investment dynamics. Therefore, in the CEMAC Zone, the depth of the credit channel is best represented by CRP, which should be the central credit aggregate in any policy transmission model aiming to connect monetary impulses to investment and output.

4.1.4. Credit Channel Time Limits in the CEMAC Zone

The time limit (lag) of the credit channel refers to the period required for monetary impulses initiated by the central bank to affect the final objective variable, here represented by nominal GDP. In practice, this lag depends on (i) the frequency of data (monthly, quarterly, annual), (ii) the institutional and structural characteristics of the financial system, and (iii) the speed with which banks translate monetary conditions into lending, and firms translate financing into investment and production. In this study, the estimation is based on annual time series, implying that time limits are interpreted in years and expressed as the number of lagged periods. The credit channel is deemed more effective when its effects are transmitted rapidly from monetary innovations to investment and output—since long delays can weaken policy credibility, reduce predictability, and limit the ability of authorities to fine-tune stabilization efforts.

A classical distinction in the analysis of monetary policy delays is proposed by Friedman (1948), who distinguishes between internal and external time limits. The internal time limit refers to the time required to (a) detect an economic problem, (b) decide on the appropriate policy instrument, and (c) implement the policy change. The external time limit refers to the period required for the implemented policy to produce observable effects on the economy's target variables (output, investment, inflation, etc.). In the context of bank-based transmission, external lags capture a sequential process: money supply conditions influence banking liquidity; banking liquidity influences loan supply; loan supply influences investment; investment influences output—with each link requiring time.

Existing empirical evidence suggests that credit-channel lags differ across economies and institutional environments. For example, Romer and Romer (1993) report average monetary transmission lags of roughly nine months for the United States, while Goux (1996) finds that in France the lag is closer to twelve months. These benchmarks highlight the importance of measuring the lag structure in the CEMAC context, where structural rigidities and banking segmentation may generate longer and more complex transmission delays.

While causality tests provide useful information on predictive linkages between variables, relying solely on Granger causality is insufficient to fully characterize the dynamic transmission mechanism. For this reason, the causality framework is complemented with Vector Autoregressive (VAR) analysis, which allows the joint estimation of dynamic interactions among monetary aggregates, credit variables, investment, and output. The VAR estimation summarized below suggests that, within the UMAC context, the response of GDP to monetary impulses is characterized by a lag structure that includes up to two years, particularly through the investment channel.

Table 4. VAR Results and UMAC Estimation (1960–2012)
Period: 1960–2012
Number of observations: 52
Note: Standard errors and Student t-statistics are shown in parentheses, following the original presentation.

	M2	CRI	CRP	INV	GDP
M2(-1)	0.686484	0.746151	14.93337	-0.526342	0.117850
	(0.35282)	(6.04418)	(33.3440)	(0.48480)	(1.10301)
	(1.94568)	(0.12345)	(0.44786)	(-1.08569)	(0.10684)
CRI(-1)	0.001740	0.511206	-1.386699	-0.016126	0.033006
	(0.01140)	(0.19527)	(1.07723)	(0.01566)	(0.03563)
	(0.15261)	(2.61800)	(-1.28729)	(-1.02964)	(0.92624)
CRP(-1)	0.001473	0.013809	0.949237	0.002063	0.001241
	(0.00222)	(0.03795)	(0.20936)	(0.00304)	(0.00693)
	(0.66503)	(0.36388)	(4.53408)	(0.67776)	(0.17925)
INV(-2)	-0.105982	-2.469272	-8.295943	-0.227330	0.085126
	(0.12394)	(2.12321)	(11.7132)	(0.17030)	(0.38747)
	(-0.85510)	(-1.16299)	(-0.70826)	(-1.33486)	(0.21970)
GDP(-1)	0.101832	0.511016	7.295286	0.579809	1.429256
	(0.09763)	(1.67253)	(9.22688)	(0.13415)	(0.30522)
	(1.04301)	(0.90343)	(0.79066)	(4.32200)	(4.68267)
C	-155.8217	-1806.171	-3702.102	-245.2649	-82.30050
	(95.5518)	(1636.88)	(9030.22)	(131.294)	(298.717)
	(-1.63076)	(-1.10342)	(-0.40997)	(-1.86806)	(-0.27551)
R^2	0.985666	0.965932	0.964649	0.984462	0.995045
Adjusted R^2	0.980724	0.954184	0.952459	0.979104	0.993336

Source: Authors' calculations from BEAC data (2013) and World Bank indicators (WDI, 2012).
Reading guide: Each column corresponds to an endogenous variable explained by lagged endogenous regressors (rows). Only significant relationships are retained here; the complete output is available from the authors.

Reduced-form GDP Equation from VAR
Using the significant coefficients extracted from the VAR estimation, the GDP transmission equation is expressed as:

$$GDP_t = 0.118M2_{t-1} + 0.033CRI_{t-1} + 0.001241CRP_{t-1} + 0.085INV_{t-2} + 1.429GDP_{t-1} - 82.30 + \mu_t$$

The Fisher statistic indicates that the model is globally significant:

- $F = 582.33$and $F > F_{5/34} = 3.71$

The estimated coefficients display the expected signs, consistent with the theoretical proposition that money supply, credit aggregates, and investment contribute positively to output dynamics. However, the individual t-statistics suggest that only lagged GDP (GDP_{t−1}) is strongly statistically significant, implying that the strongest predictor of current GDP is its own persistence. This finding is not unusual in annual macroeconomic data and reflects the structural inertia and long adjustment cycles typically observed in developing economies.

Selecting the Optimal Lag Structure: Akaike and Schwarz Criteria
To determine the appropriate lag length for the VAR, information criteria are used.
Table 5. Lag Length Selection (Akaike and Schwarz)

Lags	Akaike	Schwarz
1	78.48081	79.73465
2*	78.438	80.76027
3	78.09002	81.50246

Source: Authors' calculations.

The lag order 2 is selected because it provides the most coherent coefficient structure and aligns with theoretical expectations in annual transmission settings.

Substantively, this implies differentiated lags across the transmission chain:

- Investment reacts with a two-year delay (INV_{t−2}), reflecting slow project cycles, administrative constraints, and financing frictions.
- Other variables (M2_{t−1}, CRI_{t−1}, CRP_{t−1}) operate with a one-year delay, consistent with banking and liquidity adjustments.

This supports the argument that in the CEMAC Zone the transmission from liquidity and credit conditions to real production is relatively slow, consistent with the structural burdens and limited efficiency of the financing environment.

4.2. Macroeconomic Responses to Monetary Innovations: Impulse Response Functions

The VAR framework enables a more intuitive assessment of dynamic transmission through Impulse Response Functions (IRFs). IRFs trace the effect over time of a one-standard-deviation shock to a given variable on the other variables in the system. In this study, three monetary-policy relevant shocks are simulated:

1. a shock to money supply (M2),
2. a shock to domestic credit (CRI),
3. a shock to private sector credit (CRP).

Graph 1. Responses to a Shock in Money Supply (M2)

The IRFs indicate that an expansionary monetary impulse—captured by a positive shock to M2—is followed by measurable positive responses in the main credit and real variables:

- Domestic credit (CRI) increases for roughly three years, suggesting that excess liquidity eventually translates into higher domestic lending. This result is important because it reinforces the transmission presumption even where Granger causality did not detect a direct relationship in the bivariate tests.
- Private sector credit (CRP) responds positively and more strongly than CRI. The effect remains elevated for approximately three years before gradually declining. This supports the view that private credit is the most responsive credit aggregate in the transmission chain and constitutes a crucial "carrier variable" of monetary impulses toward productive activity.
- Investment (INV) responds positively, mainly in the short run, with an effect that is visible initially and then gradually diminishes, becoming negligible after the medium term. This pattern is compatible with the idea that liquidity shocks can stimulate investment temporarily, but structural constraints prevent the effect from being sustained without targeted credit allocation.
- GDP reacts widely and positively over approximately three years, after which the effect weakens. This confirms the earlier causality findings indicating that M2 is a strong predictor of output in the CEMAC Zone and supports the theoretical position that monetary aggregates matter for real activity when the financial system is bank-centered (Brunner, 1968; Feldstein & Stock, 1994).

Overall, Graph 1 suggests that monetary expansion has meaningful real effects, but these effects are strongest within a finite window of several years—highlighting the importance of timing and policy coordination.

Graph 2. Responses to a Shock in Domestic Credit (CRI)

Graph 2 indicates that an innovation in domestic credit generates:

- A delayed and initially negative response in investment, followed by acceleration and recovery in later periods—suggesting that domestic credit shocks may reflect compositional changes (e.g., shifts toward non-productive credit) or adjustment costs before investment responds positively.
- A short-lived positive effect on GDP (approximately 1 to 1.5 years), followed by a gradual decline that fades after roughly three years.

This pattern is consistent with the interpretation that domestic credit (CRI) may be less "productive" in its allocation, containing components that do not directly stimulate private investment (for example, credit to public entities, trade financing, or short-term credit).

Graph 3. Responses to a Shock in Private Sector Credit (CRP)

Graph 3 suggests that a shock to private sector credit:

- raises investment for about three years, after which the effect weakens;
- produces a relatively limited effect on GDP, which appears weak initially and then declines further.

This result can be interpreted in two ways: either (i) private credit expansion is not sufficiently large or persistent to translate into output gains, or (ii) credit may be directed toward activities with weaker multiplier effects (e.g., commerce and imports rather than domestic production), thereby limiting the growth impact. In both cases, the findings strengthen the central conclusion: the key issue is not only the quantity of credit, but also its allocation and sectoral orientation.

4.3. Measuring Sensitivity of the Real Sector to BEAC Innovations: Forecast Error Variance Decomposition

While impulse responses show the direction and duration of shocks, Forecast Error Variance Decomposition (FEVD) measures the relative importance of each shock in explaining fluctuations of each variable over time. Following Sims (1980), Doan (1992), Judge et al. (1987), and Goux (1996), a variable is considered highly sensitive to a given innovation when that innovation accounts for a substantial share of its forecast error variance.

The FEVD results indicate the following key sensitivities:

- Domestic credit (CRI) is moderately sensitive to M2 shocks: innovations in money supply explain about 21% of CRI variability, while CRI's own shocks explain 77%. This implies that CRI dynamics are largely driven by internal banking or credit-market factors rather than purely by monetary impulses.
- Private sector credit (CRP) is strongly sensitive to M2 shocks: money supply innovations explain about 36% of CRP variability, while CRP's own innovations account for 60%. This confirms that private credit is a more responsive component of credit to monetary expansion.
- Investment (INV) appears highly sensitive to money supply innovations: M2 shocks explain around 60% of investment variance, compared to 22% for investment's own shocks. This implies that monetary conditions are a major driver of investment dynamics in the CEMAC Zone.
- GDP is very highly sensitive to money supply innovations: M2 shocks explain roughly 70% of GDP variance. This is a particularly strong result, suggesting that output dynamics in the zone are heavily influenced by monetary conditions, and that money supply remains a decisive factor in production outcomes when policy impulses are effectively transmitted.

Taken together, these findings provide a consistent message: the real economy (investment and output) in the CEMAC Zone is strongly sensitive to monetary innovations, especially those captured by changes in M2. This reinforces the central hypothesis of the paper that monetary policy—through credit-related mechanisms—can substantially influence real activity, and that improving credit transmission and credit allocation could support growth and productive diversification.

4.4. Confirming the Weak Influence of the BEAC on Bank Credit Supply

The dynamic evidence obtained from both the causality tests and the VAR-based simulations converges toward a clear conclusion: the influence of money supply (M2) on bank credit supply is weak, and in some specifications practically negligible. This finding confirms the earlier Granger-causality outcome according to which money supply does not statistically "cause" domestic credit (CRI) or private sector credit (CRP). In operational terms, this implies that BEAC monetary policy decisions are not reliably transmitted through secondary banks' lending behavior, or at best are transmitted only imperfectly and intermittently. Consequently, the bank lending channel—the narrow form of the credit channel—appears structurally defective in the CEMAC Zone as a whole.

This diagnosis points to a bottleneck located in the relationship between the central bank and the commercial banking system. In a well-functioning credit channel, an expansionary policy (higher reserves/liquidity, lower refinancing constraints, or more accommodative monetary conditions) should induce banks to expand their credit portfolios, especially toward productive sectors. In the CEMAC context, however, the evidence suggests that banks do not significantly increase lending even under accommodative conditions, which indicates that a core condition for the effectiveness of the bank lending channel—namely the central bank's ability to influence credit supply—is not met.

Rather than translating surplus liquidity into additional credit to firms, banks appear to adjust their balance sheets in a way that preserves liquidity while limiting risk exposure. Specifically, expansionary impulses seem to produce temporary portfolio reconfigurations—a short-lived disturbance in banks' asset allocation—without generating a sustained expansion in credit supply. This outcome is consistent with the idea that banks may respond to monetary easing by increasing safe placements and liquidity buffers rather than lending, particularly in environments characterized by weak credit information systems, high perceived default risk, limited collateral enforcement, and poor bankable project pipelines.

In line with the asset–liability management perspective, surplus liquidity created or enabled by expansionary monetary policy may be rapidly sterilized at the banking-system level by being redeposited at the central bank or held as quasi-reserves, instead of being converted into productive loans. Payelle (1996) describes such behavior as a form of balance-sheet management in which banks prioritize liquidity protection and risk containment, particularly when lending opportunities

are judged costly, risky, or operationally difficult. In this sense, the behavior of CEMAC banks—despite often reporting excess liquidity—can be interpreted as a key factor weakening monetary transmission through the credit channel.
From a policy standpoint, these results imply that the main issue is not merely the availability of liquidity in the system, but rather the conversion of liquidity into credit, and of credit into productive investment. The malfunctioning of the transmission process therefore appears rooted in institutional and structural constraints that prevent monetary impulses from generating proportional responses in bank lending.

5. Conclusion and Policy Implications

This study assessed monetary policy transmission in the CEMAC Zone by focusing on the measurement and operational diagnosis of the credit channel, rather than limiting the analysis to simple correlations or isolated causality checks between financial and real variables. While many studies evaluate transmission largely through whether macroeconomic aggregates react to monetary variables, this work follows a more policy-relevant approach by measuring the credit channel through its key parameters—width, depth, flow/outflow, and time limits—which provides a more concrete quantification of how monetary policy functions in a predominantly debt-based, bank-centered financial system.
Four main conclusions emerge.
First, the credit channel in the CEMAC Zone is structurally narrow. Firms have very limited ability to substitute between bank lending and market-based financing (equity or bond issuance). The overwhelming dominance of banking credit in external financing implies that shocks affecting banks' lending behavior have amplified consequences for firms and economic activity. In such a financial architecture, SMEs—despite being central to the productive structure—often face exclusion because banks' lending decisions favor the most collateralized and least risky borrowers, increasing the external finance premium and reinforcing credit rationing dynamics.
Second, the channel exhibits a weak flow/outflow, meaning that BEAC impulses do not translate into clear, systematic changes in credit supply. Even when liquidity conditions ease, commercial banks may respond by reallocating portfolios and building reserves rather than expanding productive lending. This weak central bank–bank transmission undermines the effectiveness of monetary policy and reduces the capacity of policy authorities to influence investment through standard monetary instruments.
Third, the channel's depth is best captured by private sector credit (CRP). Although causality tests do not always show a strong M2 → credit relationship, both the transmission logic and the response patterns indicate that CRP is the most relevant credit aggregate for tracing monetary effects toward investment. In other words, the private credit component is the most meaningful "carrier variable" of credit transmission, since it is more closely connected to productive financing conditions than broad domestic credit.
Fourth, the transmission process is characterized by a relatively long time limit. The combined evidence suggests that monetary impulses affect real activity with delays that can extend to approximately two years, particularly through investment dynamics. This lag structure is consistent with the institutional and structural burdens of the regional economy (administrative frictions, project gestation periods, financing bottlenecks, and limited investment responsiveness).
Policy Implications
Given these findings, improving monetary transmission through the credit channel requires reforms that strengthen the BEAC's capacity to influence bank lending to productive sectors, while preserving financial stability. In particular:

1. Strengthening BEAC leverage over commercial banks. Because the transmission bottleneck appears to lie in the central bank–commercial bank relationship, it is necessary to strengthen oversight and enforcement mechanisms so that monetary decisions are reflected in banks' credit behavior, not only in liquidity positions.
2. Introducing targeted credit allocation mechanisms.One option is to introduce credit allocation benchmarks or quotas tied to productive activities (manufacturing, agriculture, and tradable sectors), particularly when expansionary monetary policy is adopted. Such mechanisms should be carefully designed to avoid excessive risk-taking and should be accompanied by monitoring and prudential safeguards.
3. Aligning money supply growth with financing needs of the productive economy.Monetary expansion should not remain disconnected from real financing needs. When liquidity expansion is repeatedly sterilized into reserves rather than lending, policy effectiveness collapses. Strengthening credit infrastructure (credit registries, collateral registries, insolvency enforcement, SME guarantees) can reduce risk perceptions and improve the conversion of liquidity into credit.
4. Re-centering monetary policy toward a growth-supporting mandate.If monetary policy remains unable to support capital formation and productive restructuring—financing SMEs/SMIs, expanding formal employment, and shifting the economy from intermediation toward production—then it will remain ineffective for long-term development objectives. This underscores the importance of pursuing a dual mandate approach: preserving monetary stability while explicitly supporting economic growth and productive investment.

Finally, as monetary policy affects development outcomes and societal welfare, the institutional governance of the central bank can be strengthened through more transparent accountability mechanisms. One possible route is to ensure that the

BEAC's objectives and instruments are aligned with the region's economic emergence strategy, potentially through enhanced coordination with sub-regional institutions (including parliamentary oversight), while maintaining operational independence and credibility in stability policy.

Notes (Rewritten for Publication Style)

1. The causal relationships in the credit channel were tested and used to inform the selection of lag structures in the VAR model.
2. Market capitalization refers to the combined equity and bond values of the two sub-regional exchanges: the Douala Stock Exchange (DXE) and the Central Africa Stock Exchange (BVMAC, Libreville).
3. Evidence on the gap between central bank intentions and banking practices is supported by an interview reported in *Cameroon Tribune* (No. 8650/4849, July 27, 2006, p. 5) concerning the Association of Professionals of Credit Institutions in Cameroon (APEC).
4. Values in parentheses correspond respectively to standard errors (first line) and Student t-statistics (second line) used for coefficient significance testing.
5. Full forecast error variance decomposition results are available from the authors upon request.

Appendices

This appendix reports the Augmented Dickey–Fuller (ADF) unit-root tests for the first-differenced series of the key variables: M2, CRI, CRP, INV, and GDP. The results consistently reject the null hypothesis of a unit root after differencing, confirming that all variables become stationary in first differences and are therefore integrated of order one, I(1). Lag length selection is based on the Schwarz Information Criterion (SIC), consistent with standard time-series practice.

Ethical Considerations

This study is based exclusively on the analysis of secondary data, theoretical frameworks, and previously published institutional and macroeconomic sources. It does not involve human participants, personal data, clinical trials, surveys, interviews, or experimental procedures. Consequently, no ethical approval from an institutional review board or ethics committee was required.

The authors confirm that the research was conducted in accordance with internationally accepted standards of academic integrity, transparency, and responsible research conduct. All sources used in the study are properly cited, and no form of plagiarism, data fabrication, or misrepresentation has occurred.

Acknowledgements

The authors would like to express their sincere appreciation to colleagues and researchers who contributed indirectly to this work through academic discussions, critical insights, and constructive feedback during the development of the manuscript. Special thanks are extended to the academic community working on monetary policy, development economics, and post-Keynesian theory, whose contributions provided valuable intellectual foundations for this research. Any remaining errors or omissions are the sole responsibility of the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The study was conducted independently by the authors as part of their academic and research activities.

Author Contributions

Jean Luis Ekomane and Benjamin Yamb jointly contributed to the conceptualization and design of the study.

Jean Luis Ekomane led the theoretical framework development, literature review, and interpretation of monetary policy transmission mechanisms within the CEMAC context.

Benjamin Yamb contributed to the analytical structure, methodological orientation, and critical revision of the manuscript.

Both authors participated equally in drafting, revising, and approving the final version of the manuscript and agree to be accountable for all aspects of the work.

Conflict of Interest

The authors declare that they have no known financial or personal relationships that could have appeared to influence the work reported in this paper. There is no conflict of interest associated with the publication of this manuscript.

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Appendices

Unit Root Test for M2, CRI, INV, PIB, CRP

Null Hypothesis: D(CRI) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=1)				
		t-Statistic		Prob.*
Augmented Dickey-Fuller test statistic		-6.656913		0.0000
Test critical values:	1% level	-4.148465		
	5% level	-3.500495		
	10% level	-3.179617		
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(CRI,2)				
Method: Least Squares				
Date: 11/11/16 Time: 18:21				
Sample (adjusted): 3 53				
Included observations: 51 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CRI(-1))	-0.980746	0.147327	-6.656913	0.0000
C	-4.72E+10	8.03E+10	-0.587652	0.5595
@TREND(1)	5.16E+09	2.68E+09	1.924720	0.0602
R-squared	0.480827	Mean dependent var		1.15E+10
Adjusted R-squared	0.459195	S.D. dependent var		3.73E+11
S.E. of regression	2.74E+11	Akaike info criterion		55.56834
Sum squared resid	3.61E+24	Schwarz criterion		55.68198
Log likelihood	-1413.993	Hannan-Quinn criter.		55.61176
F-statistic	22.22737	Durbin-Watson stat		1.967922
Prob(F-statistic)	0.000000			

Unit Root Test for M2

Null Hypothesis: D(M2,2) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=1)				
		t-Statistic		Prob.*
Augmented Dickey-Fuller test statistic		-13.37324		0.0000
Test critical values:	1% level	-4.152511		
	5% level	-3.502373		
	10% level	-3.180699		
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(M2,3)				
Method: Least Squares				
Date: 11/11/14 Time: 16:10				
Sample (adjusted): 4 53				
Included observations: 50 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M2(-1),2)	-1.583592	0.118415	-13.37324	0.0000
C	-5.20E+10	5.63E+10	-0.925050	0.3597
@TREND(1)	3.25E+09	1.82E+09	1.785303	0.0807
R-squared	0.791893	Mean dependent var		1.38E+09
Adjusted R-squared	0.783037	S.D. dependent var		3.96E+11

S.E. of regression	1.84E+11	Akaike info criterion		54.77681
Sum squared resid	1.60E+24	Schwarz criterion		54.89153
Log likelihood	-1366.420	Hannan-Quinn criter.		54.82050
F-statistic	89.42248	Durbin-Watson stat		2.281168
Prob(F-statistic)	0.000000			

Unit Root Test for INV

Null Hypothesis: D(INV) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=1)				
		t-Statistic		Prob.*
Augmented Dickey-Fuller test statistic		-5.474027		0.0002
Test critical values:	1% level	-4.148465		
	5% level	-3.500495		
	10% level	-3.179617		
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(INV,2)				
Method: Least Squares				
Date: 11/11/14 Time: 16:13				
Sample (adjusted): 3 53				
Included observations: 51 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INV(-1))	-0.766361	0.140000	-5.474027	0.0000
C	-1.68E+11	1.04E+11	-1.606054	0.1148
@TREND(1)	1.29E+10	3.94E+09	3.268651	0.0020
R-squared	0.384679	Mean dependent var		1.44E+10
Adjusted R-squared	0.359041	S.D. dependent var		4.27E+11
S.E. of regression	3.42E+11	Akaike info criterion		56.00870
Sum squared resid	5.60E+24	Schwarz criterion		56.12234
Log likelihood	-1425.222	Hannan-Quinn criter.		56.05213
F-statistic	15.00403	Durbin-Watson stat		2.055660
Prob(F-statistic)	0.000009			

Unit Root Test for GDP

Null Hypothesis: D(GDP) has a unit root			
Exogenous: Constant, Linear Trend			
Lag Length: 0 (Automatic - based on SIC, maxlag=1)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.19820	0.0000
Test critical values:	1% level	-4.148465	
	5% level	-3.500495	
	10% level	-3.179617	
*MacKinnon (1996) one-sided p-values.			
Augmented Dickey-Fuller Test Equation			

Dependent Variable: D(GDP,2)				
Method: Least Squares				
Date: 11/11/14 Time: 16:15				
Sample (adjusted): 3 53				
Included observations: 51 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.367523	0.134095	-10.19820	0.0000
C	-6.59E+11	3.97E+11	-1.658973	0.1036
@TREND(1)	6.18E+10	1.41E+10	4.393736	0.0001
R-squared	0.684224	Mean dependent var		3.37E+10
Adjusted R-squared	0.671067	S.D. dependent var		2.33E+12
S.E. of regression	1.34E+12	Akaike info criterion		58.73993
Sum squared resid	8.60E+25	Schwarz criterion		58.85357
Log likelihood	-1494.868	Hannan-Quinn criter.		58.78336
F-statistic	52.00321	Durbin-Watson stat		1.944518
Prob(F-statistic)	0.000000			

Unit Root Test for CRP

Null Hypothesis: D(CRP) has a unit root				
Exogenous: Constant, Linear Trend				
Lag Length: 0 (Automatic - based on SIC, maxlag=1)				
		t-Statistic		Prob.*
Augmented Dickey-Fuller test statistic		-4.343592		0.0059
Test critical values:	1% level	-4.148465		
	5% level	-3.500495		
	10% level	-3.179617		
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(CRP,2)				
Method: Least Squares				
Date: 11/11/14 Time: 16:17				
Sample (adjusted): 3 53				
Included observations: 51 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CRP(-1))	-0.590189	0.135876	-4.343592	0.0001
C	-4.10E+10	4.69E+10	-0.873627	0.3867
@TREND(1)	3.28E+09	1.62E+09	2.029136	0.0480
R-squared	0.284944	Mean dependent var		8.96E+09
Adjusted R-squared	0.255150	S.D. dependent var		1.84E+11
S.E. of regression	1.59E+11	Akaike info criterion		54.47409
Sum squared resid	1.21E+24	Schwarz criterion		54.58773
Log likelihood	-1386.089	Hannan-Quinn criter.		54.51752
F-statistic	9.563800	Durbin-Watson stat		2.068207
Prob(F-statistic)	0.000319			