

External Shocks and Economic Cyclical Fluctuations in Ivory Coast

Sieni Toussaint Oulai

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External Shocks and Economic Cyclical Fluctuations in Ivory Coast

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Abstract

This study examines and compares the impact of external shocks with that of internal shocks over economic cyclical fluctuations in Ivory Coast. We will use a Structural Vector Autoregressive (SVAR) model over the period 1965-2014. The results show that shocks on the real GDP have a more significant impact on economic activity. Furthermore, internal shocks are the main cause of cyclical fluctuations in Ivory Coast, while external shocks are only secondary effects on the national economy. We argue in favour of the constitution of financial reserves, the diversification of the production sector, and progressive industrialization of the economy.

Key Words: business cycle fluctuation, external and domestic shocks

1. Introduction

International financial instability caused by the process of financial globalization and questions on the present disequilibrium at the international level have led to a renewed interest in the analysis of the effect of external shocks on macroeconomic fluctuation (Obstfeld & Rogoff, 2004). Indeed, literature on the sources of economic cyclical fluctuations does not allow for one to arrive at the conclusion on the primacy of either external shocks or internal shocks. An economic cyclical fluctuation is a cyclical change of economic indicators (Bormotov, 2009), due to factors such as poor management of public finance, political instability, internal conflict, natural catastrophes, variations in exchange rates, and petroleum prices. In this study, it is measured through the Hodrick-Prescott filter (HP) method. A shock is an event that is produced in an unexpected manner (Fuchs-Schundeln, 2008).

Several studies highlighting the effects of external shocks affirm that shocks in developing countries have significant impacts on cyclical fluctuations in emerging economies and developing countries (Canova, 2005; Sato et al., 2009). However, conclusions from empirical studies do not seem to agree on the primordial role played by external shocks in cyclical fluctuations (Ziky & Mansouri, 2003; Raddatz, 2005). Various studies have affirmed that external shocks are the main causes of cyclical fluctuations (Mendoza, 1995; Kandil, 2000; Sosa, 2008). However, others estimate that external shocks play a secondary role, and that it is internal shocks that best explain cyclical variations (Hoffmaister & Roldos, 2001; Boschi & Girardi, 2008).

The effects of the recent financial crisis have highlighted the fact that growth perspectives of developing countries are highly dependent on changes in the international environment. Indeed, the 2008 financial crisis that affected most developed economies also had repercussions on several developing countries. Generally, a small open economy is exposed to a series of external shocks. These shocks are transmitted to the national economy through various channels and adjustment mechanisms. Business transactions and investment flows are factors that influence economic growth in such countries, but trade and financial openness could also contribute to the transfer of external shocks on their economic performance.

Ivory Coast is a small open economy whose economic cycle is strongly influenced by changes in the international environment. Economic shocks such as petroleum price shocks, international exchange rates and shocks of foreign demand are likely to affect the economy of the country. All these reasons lead us to believe that external

shocks play a significant role in explaining the volatility in terms of production in the country. Therefore, the identification and evaluation of sources of spreading foreign shock mechanisms are useful, not only in terms of explaining cyclical fluctuations in Ivory Coast, but also for planning and effecting macroeconomic policy.

This study examines and compares the impact of external shocks with that of internal shocks over economic cyclical fluctuations in Ivory Coast through the use of a Structural Vector Autoregressive (SVAR) model covering the period 1965-2014. Moreover, the analysis is carried out so as to identify the determinants of the significance of shocks on cyclical fluctuations in the country. The results demonstrate that shocks on real GDP account for a large part of cyclical fluctuations. Also, external variables included in the analysis (terms of trade, and cocoa prices) have very little impact on the national economy variables. They also reveal that internal shocks have more significant effects on the national economy and cyclical fluctuations than external shocks. However, the impact of external shocks on domestic variables should not be ignored because their effects are varied and could indirectly and progressively influence cyclical fluctuations.

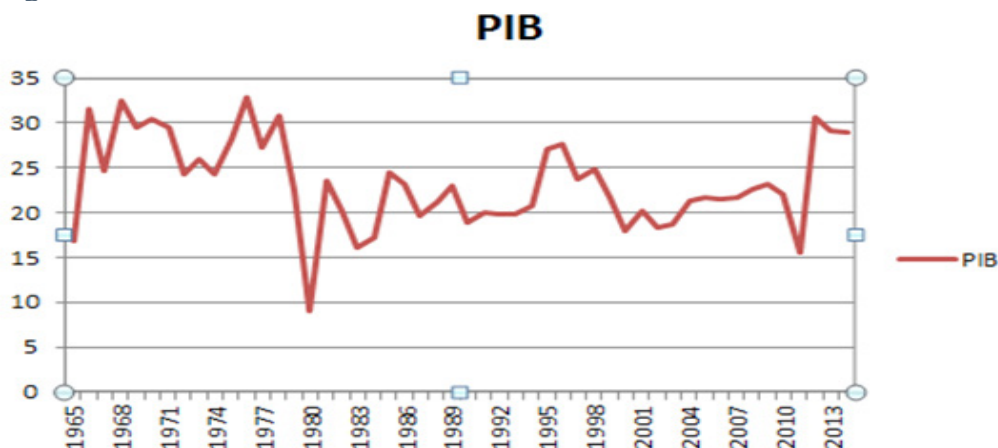
The article is organized in the following manner: Section 1 presents the evolution of the economic situation in Ivory Coast. Section 2 deals with a review of empirical literature on the impact of internal and external shocks as causes of cyclical fluctuations. Section 3 addresses the empirical methodology used, and section 4 focuses on results and their interpretation. Section 5 concludes the article with some recommendations for economic policy.

2. The evolution of the economy of Ivory Coast

An analysis of major tendencies of Ivory Coast's economic revolution lead to a distinction between three major periods; namely, one starting from 1960 to 1979, another from 1980 to 2011, and from 2012 to 2015. The second period is marked by two significant events related to the devaluation of the FCFA in 1994 and to a period of major political instability that lasted from 1999 to May 2011.

The evolution of GDP since 1965 gives a clear illustration of those three major trends (Figure 1). The GDP almost doubled from 1960 to 1979 before dropping and then experiencing some sort of steadiness until 2011, then achieving strong growth since 2012. The rate of poverty increased, rising from 10% in 1985 to 48.9% in 2008. After the 2011 post-election crisis, more than half of the population lived below the poverty threshold.

Figure 1: Evolution of GDP from 1965 to 2014

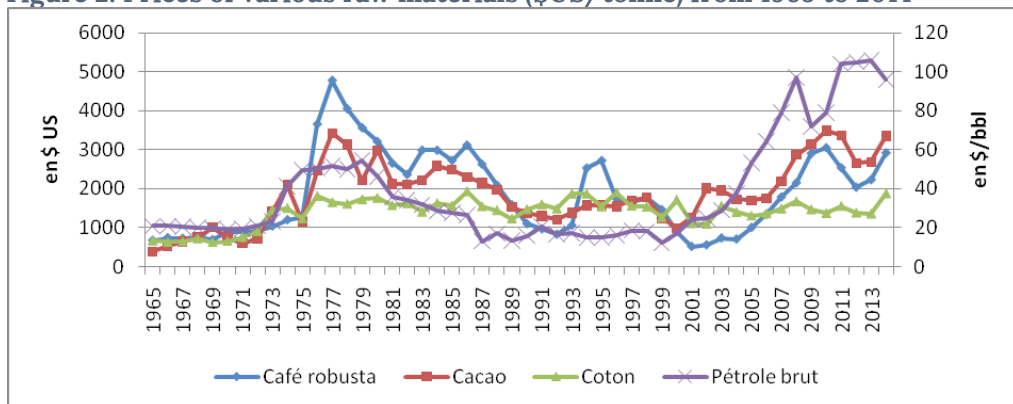


Source: Data derived from BCEAO.

Since the formulation and operationalization of the 1960-1970 10-year outlook and the 1971-1975 and 1976-1980 five-year development plans, the government's actions revolved around well-reviewed strategic objectives at the transverse as well as vertical directions. In the transversal direction, authorities chose a liberal economy which

was open to the rest of the world. Economic growth thus depended highly on private and public investment combined with a significant inflow of foreign manpower. The business climate during this period was conducive for the growth of the manufacturing sector, notably agro-industry, construction materials as well as the service sector (transport of passengers and goods, tourism). In the vertical direction, the choices were essentially based on investments in the agricultural sector, infrastructure, and the wood industry. Thus, in the agricultural sector, export crops such as cocoa, coffee and cotton benefitted from natural assets which are fertile soils and adequate rainfall. This sector also benefitted from investments and the technical and financial support of public authorities. These crops represented almost 70% of goods exported. The primary sector, which accounted for 35% of GDP, employed more than two-thirds of the population. However, since 1979 until the early 2000s, the downward trend in the mean price of cash crops (cocoa, coffee) in the international markets has led to a decrease in economic growth.

Figure 2: Prices of various raw materials (\$US/tonne) from 1965 to 2014



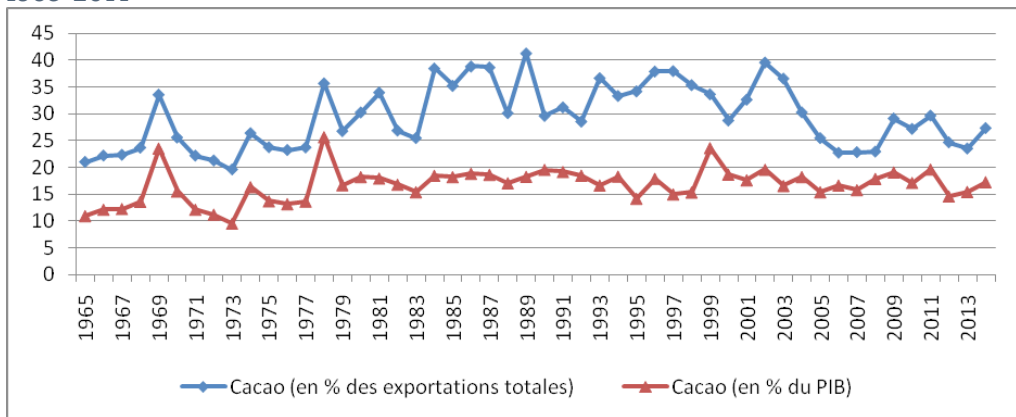
Source: INS/CBWAS.

Indeed, economic growth in Ivory Coast was quite exposed to foreign exchange fluctuations due to the country's dependence on raw materials whose prices in the international market are quite volatile. Ivory Coast was extremely vulnerable to external shocks, notably to trend reversals in prices of coffee and cocoa. Per capita GDP which had been increasing by 3.9% per annum in the 1970s, dropped to 3.7% per annum from 1979 to 1993 (WID) The processing of these products remained relatively low. Population increased at an average annual rate of 4.2% which created pressure on social services such as health, education and housing. Regions that had benefitted the most from the growth are those that produced cash crops, which led to regional disparities in terms of distribution of growth benefits. Also, the exploitation of forests and their precious wood was no longer sustainable.

The growth strategy based on raw materials, particularly cocoa, continued being implemented over the past three decades. The economy, however, diversified with

the production of petrol and gas products, the exploitation of new mines of gold, diamond and other minerals as well as the progressive development of the secondary and service sectors. Despite the diversification of agricultural production (cocoa, coffee, bananas, pineapples, yams, cashew nuts, rubber trees), cocoa continues to-date to represent in itself close to 70% of raw material exports, more than 30% in terms of export of goods, and 15% of the GDP. Given the various sectors linked to cocoa production, notably land and maritime transport, commerce and credit, major macroeconomic equilibria are thus more susceptible to price fluctuations in international markets. Furthermore, primary products continued being exported, mostly in their raw unprocessed state and thus with little value addition. At the end of the 1980s and the beginning of the 1990s this decline was exacerbated by a strong over-valuation of the FCFA Franc.

Figure 3: Percentage share of cocoa beans as a percentage of GDP and exports, 1965-2014



Source: INS/BCEAO.

Furthermore, the business environment was marked by the strong presence of the state with governance problems that hurt competitiveness of the economy and the blossoming of a dynamic public sector. Positive episodes have, however, been witnessed, notably at the beginning of the 1990s and after the devaluation of the FCFA in 1994, with a notable increase in investments and a steady per capita GDP from 1995 to 1998. Over the last decade, the farm gate prices received by cocoa and coffee producers decreased to represent only 30% of the international prices. This situation was exacerbated by a difficulty in the sale of agricultural products due to inadequate demand and the low level of prices. In addition to the drop in prices of raw materials which led to the unfavourable cycles of the years 1998-2000, where growth was limited to 4.5% on average against 7% from 1995 to 1997, the economy of Ivory Coast suffered from some structural fragility that affected the stability of the country. Indeed, the economy of Ivory Coast suffers from a low rate of investments, an

inadequate financial system and uncertainty in terms of macroeconomic stabilization. The country has experienced a long period of political instability brought about by the coup d'État carried out by the military in December 1999 and September 2002 which mutated into a military-political crisis and a civil war brought about by the post-electoral crisis of December 2010 to April 2011.

Overall, despite the inception of the diversification of its economy, Ivory Coast continues to be heavily reliant on raw materials. Following the successive crises and a certain level of opacity in the management of public resources, the country has not fully benefitted from the significant improvement in terms of trade since the beginning of the 21st Century.

3. Literature review

Economic integration of a country in the global market generally involves trade and financial linkages with other countries. Thus shock in one country could have financial and trade impacts such as a decrease in bank loans, foreign direct investments, exports and imports, bank runs and other capital flows in another country. It is therefore necessary to take external shocks into account in the analysis of economic cyclical fluctuations from a theoretical and empirical perspective.

In order to explain cyclical fluctuations, pioneer studies developed real-business-cycle models (Mendoza, 1991; Backus et al., 1994). Following these studies, other studies extended the basic simplified real closed-cycle model to two open economies. They based this upon the principal that technological shocks are likely to affect economic variables. However, the problem is that they are only interested in technological shocks, thus ignoring other types of shocks.

Several recent studies have adopted time series models (Simple VAR, Structural VAR, VEC, Panel VAR) so as to take into account the totality of shocks that could affect an economy. The departure point for these studies is that of Calvo et al. (1993). They examine the relevance of external shocks on markets in emergent economies by using a Structural Vector Autoregressive (SVAR) model. They conclude that, over the period 1988-1992, external shocks accounted in a significant manner for the variation of real exchange rates in South American countries.

In the wake of these studies, Canova (2005) studied the extent and the characteristics of the transmission of shocks in the United States on South American countries (Mexico, Panama, Ecuador, Argentina, Uruguay, Peru, Brazil, and Chile). He identifies American structural shocks by using the two-step procedure, and then he simulates statistical shocks in VAR models for each Latin American country. He shows that the American demand and supply shocks generate insignificant fluctuations on Latin American economies. American currency fluctuations lead to significant and substantial reactions in terms of several macroeconomic variables in Latin American countries. Interest rates are a major cause of American currency fluctuations, while trade seems to play a role that is not negligible. On its part, transmission occurs, almost instantly, in terms of certain variables for Latin American countries, after a certain point is reached in the shocks. Shocks in the United States explain the substantial segments of the differences of macroeconomic variables in Latin America, leading to continental cyclical fluctuations and have a destabilizing effect on the nominal

exchange rate. He demonstrates that the existence of differences in reactions from countries with flexible and fixed exchange rates is more related to the extent of the shock effects than to the transmission model. Gimet (2007) studies the causes of destabilization in the MERCOSUR member countries (Argentina, Brazil, Bolivia, Chile, Paraguay, and Uruguay) which are due to floating currencies. Using structural VAR, she examines the impact of the restrictive monetary policy of the United States, a decrease in confidence by the financial markets, and an increase in the global prices of agricultural products, on the real, financial and monetary sectors of these countries. These results demonstrate that, regardless of the exchange rate regime in place, countries mostly react to external variations, notably in the stock markets. Furthermore, the harmful effects of these shocks spread from the financial sphere to the real sphere with, as a consequence, a significant drop in production. This explains the lack of sustainability in exchange rate regimes that have been in place over the past decade, and also the high vulnerability of these countries to external variations. Which then make us understand the fact that the countries have greatly suffered from the negative consequences of the financial crises that affected emergent economies.

Raddatz (2008) uses panel VAR to quantify and compare the role of internal and external shocks as causes of macroeconomic fluctuations in 38 African countries between 1963-1989 and 1990-2003. He concludes that external shocks are the reason for an increased volatility in production over the past 15 years in the African countries under study. This is due to two reasons: first, a lowering of the variance in internal shocks and secondly, an increase in the vulnerability by production to external shocks. Contrary to the significance attributes to the price of petrol in other studies, his study concludes that petroleum shocks are not quite significant in terms of production volatility for petrol producing countries. Sato et al. (2009) demonstrate that the shocks in the United States and in Japan were major causes of disturbances in the Asia region before the financial crisis, especially over the period 1978-1987, and also in the short- as well as long-term post-crisis period. They observe that the shocks in the United States became the main sources of disturbance in most Asian countries with the exception of China, while Japan's influence reduced. The influence of shock in China translates into a growth trend over time, but the size is still minimal and thus not comparable to that of shock in the United States. The global oil shock is more and more substantial, thus affecting the stability of growth and real production in the region, notably in the economies of China, Hong Kong, Singapore, and Thailand. This proves the fact that their industries are highly dependent of their petroleum stocks. The results also indicate that a large part of East Asian economies have had positive instinctual responses to external shocks coming from the United States of America over different periods in time, with the exception of Indonesia during the post-crisis period of the Asian economy. The instinctual responses to regional shocks coming from China and Japan have shown a rising tendency, especially during the post-crisis period of the Asian economy, but the extent has been little and not comparable to that of the United States during that entire period.

Contrary to the above-mentioned studies, various studies have shown that external shocks have very little impact in determining economic cyclical fluctuations. Hoffmaister and Roldos (2001) study fluctuations in the economic cycles of Brazil and Korea. They conclude that external shocks have a weak effect on Gross Domestic Product (GDP). Internal shocks are the main causes of fluctuations in the exchange rates and production, notably for shocks related to the supply of production factors. Raddatz (2005) quantifies the impact of various external shocks using a panel VAR model and compares their contribution to that of internal shocks to production volatility in countries with low income levels. He demonstrates that even though external shocks have substantial effects on real economic activity, especially when compared to the average economic performance of countries with low income, they only represent a small fraction of the volatility of real GDP in those countries. Economic instability in countries with low income mostly results in internal shocks. Boschi and Girardi (2008) use VAR and VEC models to estimate the significance of internal and external shocks on variations in economic cycles of Latin American countries. They conclude that internal shocks and regional shocks are the main sources of fluctuations in production in Latin American countries.

Most studies on the effects of shocks on economic cyclical fluctuations of developing countries are undertaken in South America and in Asia. Very few studies focus on Africa (Ziky & Mansouri, 2003; Zigui, 2005; Raddatz, 2005, 2008). This study depends on such literature in order to measure the relative impact of various types of external shocks on their importance vis-a-vis internal shocks with the exception of production fluctuations in Ivory Coast. The use of a SVAR model allows us to, not only evaluate the direct impact of changes in foreign variables included in the model, but also the indirect effect through the intermediary of the reactions of other foreign and domestic variables. Secondly, this article uses data collected over a long period (1965-2014) so as to include all the changes experienced in the economy of Ivory Coast.

4. Econometric data and methodology

4.1. Data sources and data description

This article uses annual secondary data (time series data) covering the period 1965-2014. The data is derived from the World Bank database (WID), the Central Bank of West African States (BCEAO) and the Macrobond data base. It has all been processed in logarithms.

Thus, the variables of our study are those currently in use in economic literature (Ziky & Mansouri, 2003; Raddatz, 2008; Al-Jawarneh & Sek, 2012) and in particular, under the framework of this study, we have introduced the international price of Cocoa.

The increased openness of the economy of Ivory Coast has subjected the country to favourable and unfavourable effects of changes felt in international markets. We believe that in the case of the economy of Ivory Coast, it would be more useful to choose terms of trade (TE) and the price of Cocoa (PC). Variations in the prices of goods are generally measured by the TE, considered as an external shock that is purely exogenous because Ivory Coast is a “price taker” country. The price of exported and imported goods is determined by global markets. The effects of net trade expectations correspond with the difference between actual values of exports and imports and their value measured in constant prices, estimated on the basis of the price of a reference period. As an indicator that measures the relative price of exports and imports, the TE could be calculated as follows:

$$TE = \frac{\textit{export}}{\textit{import}} \times 100$$

Where, *export* is the indicator of the mean value of exports and *import* is the index of the mean value of imports.¹

The price of cocoa (PC) allows for the taking into account of the effect of changes in international prices of cocoa on production. Ivory Coast is the leading exporter of cocoa globally, and cocoa exports represent close to 45% of the overall income of the country. It is also a price taker, and therefore a shock in international prices would have a considerable impact on the country.

Furthermore, external variables and fluctuations in the economic growth rates

could be explained through internal variables. Thus, it is important to introduce a bloc of domestic variables in the structural VAR model in addition to the variables that measure changes experienced in international markets. Internal shocks could either be driven by economic policies or be purely exogenous. They could, also, contribute to a reduction in the domestic economy's vulnerability to external shocks. In regard to endogenous domestic variables, we selected the following variables: real GDP (PIB); Final Consumption Expenditure by the government (DCG); and the Consumer Price Index (IPC).

In seeking to evaluate the contribution of external prices on fluctuations in economic activities, we believe that it could be measured in an appropriate manner using the real Gross Domestic Product (real GDP). It allows for better calculation of the impact of changes in production (real shocks). This variable also allows for the calculation, through a corresponding structural VAR equation, of an innovation commonly referred to as "supply shock". Generally, the evolution of productivity or real shocks can be accounted for by the supply shock. In regard to government Final Consumption Expenditure and the Consumer Price Index, these could give information on shocks on the basis of economic policies. The Consumer Price Index is used to take into consideration the ultimate objective of the monetary policies of the central bank which targets internal and external currency stability. In Ivory Coast, the price levels are directly related to decisions concerning macroeconomic policies, in particular the monetary policy managed by the Central Bank of West African States (BCEAO). As far as the government's Final Consumption Expenditure is concerned, it allows for the taking into account of the budgetary policy, in particular public expenditure. It gives us information on social transfers in terms of household management. Changes in government Final Consumption Expenditure give us information on the evolution of the level of economic activity. Indeed, an increase in government Final Consumption Expenditure has positive effects on the overall demand and supply.

4.2. Identification of structural VAR

Since the seminal studies undertaken by Sims (1980), researchers consider VAR methodology as the most suitable framework for analysing fluctuations in terms of innovations. This methodological approach was developed following recent studies in the domain of the analysis of time series.

Giving the vector autoregression VAR model representation in its reduced form:

$$X_t = \sum_{i=1}^5 A_i X_{t-1} + \varepsilon_t \quad (1)$$

Where, X_t is the vector of explained variables, A_i is the square matrix of coefficients to be estimated, and ε_t is the vector of residuals. ε_t represents each point of time t , the value of X_t not explained by the past behaviour of X . These residuals could thus be considered as innovations or impulses.

The chosen structural VAR could be written in the form of a matrix in which the vector of explained variables

$$\Delta X_t = \begin{pmatrix} \Delta PC \\ \Delta TE \\ \Delta PIB \\ \Delta IPC \\ \Delta DCG \end{pmatrix}$$

or PC is the price of cocoa, TE are the terms of trade, PIB is the Gross Domestic Product, IPC is the government Consumer Price Index, and DCG is the consumption expenditure by the government. It would be appropriate to consider the first variable as a cocoa price shock, whereas the second and third variables could be referred to as shocks in terms of trade and a “shock on economic activity”. In regard to the fourth and fifth variables, they could be, respectively, interpreted as demand shocks resulting from macroeconomic policies and public expenditure. Consequently, the vector of structural shocks associates with each variable takes the following form:

$$\varepsilon_t = \begin{pmatrix} \varepsilon_{pc} \\ \varepsilon_{te} \\ \varepsilon_{pib} \\ \varepsilon_{ipc} \\ \varepsilon_{dcg} \end{pmatrix} \text{ or } \varepsilon_{pc}, \varepsilon_{te}, \varepsilon_{pib}, \varepsilon_{ipc}, \varepsilon_{dcg} \text{ represent, the shock of cocoa prices,}$$

the shock of terms of trade and the shock on economic activity, the demand shock and the shock of public expenditure, respectively.

However, this simple definition of shocks could be misleading because the residuals of the canonical VAR model are correlated. The identification of structural shocks is done through the imposition of short- and/or long-terms. The number of constraints required for the identification of structural innovations in our VAR system are six. We hereby propose to examine and apply Cholesky’s decomposition as an identification method. Cholesky’s decompositions method imposes a recursive structure of residuals that lead to the rejection of the instantaneous impact of various structural shocks over various macroeconomic variables. This type of identification necessitates an appropriate order in the introduction of variables in the VAR to be estimated. We preferred the following order: Gross Domestic Product (PIB), terms of trade (TE), Consumption Price Index (IPC), Price of Cocoa (PC) and the government’s Final Consumption Expenditure (DCG). This order assumes that the first variable of the order (cocoa price) has an impact on all the variables, but none of the other variables has an impact on the price of cocoa. In other words, we assume that the first variable has a contemporary effect on all other variables, but that none of the other variables have a contemporary effect on the former. The second variable of the order is assumed to have a contemporary effect on all other variables, except the first. The order of other variables in our model was determined in the same manner.

4.3. Characteristics of the series

Stationarity and cointegration tests were the necessary preconditions required because they may influence the dynamics of the system. In regard to stationarity tests, we resorted to the use of the augmented Dickey-Fuller (ADF) as well as the Phillips-Perron (PP) test. These tests will be complemented by the Kwiatkowski, Phillips, Schmidt and Shin test (KPSS) which has the advantage of being based upon a different calculation. It reverses the proposition accepted as a null hypothesis: (H0: unit root) during the execution of ADF or PP tests by replacing them with the null hypothesis (H0: stationarity). KPSS tests allow us to come to a conclusion in case of the non-rejection of H0 in the other two tests. Table 1 summarizes the results of unit-root tests for the five selected variables. ADF, PP, and KPSS statistics agree on non-stationarity of the selected variables, namely real GDP, government's Final Consumption Expenditure, terms of trade and the price of cocoa, with the exception of the Consumer Price Index. It is evident from the stationarity tests that, besides the Consumer Price Index, which is stationary at level I(0), the other variables are stationary in first differences (1).

Table 1: Unit-root test

	At level			In first differences		
	ADF	PP	KPSS	ADF	PP	KPSS
PIB	1.040 (-1.947)	0.907 (-1.947)	0.279* (0.463)	-6.022* (-1.947)	-6.036* (-1.947)	0.081* (0.463)
IPC	-1.425 (-1.947)	-2.441* (-1.947)	0.323* (0.463)	-7.591* (-1.947)	-10.373* (-1.947)	0.096* (0.463)
DCG	2.002 (-1.947)	2.002 (-1.947)	0.843 (0.463)	-6.056* (-1.947)	-6.056* (-1.947)	0.241* (0.463)
TE	-0.426 (-1.947)	-0.253 (-1.947)	0.252* (0.463)	-9.383* (-1.947)	-12.120* (-1.947)	0.211* (0.463)
PC	-0.380 (-1.947)	-0.269 (-1.947)	0.216* (-0.463)	-5.592 (-1.947)	-6.317* (-1.947)	0.095* (0.463)

Source: Author with data derived from E-views.

NB: () stands for t-student.

* corresponds to a significance by 1%.

In order to determine the cointegration interval, we resorted to the use of tests developed by Johansen and Juselius (1990) based on maximum likelihood. The trace of the statistic (λ_R) allows for the testing of the hypothesis of the r cointegration relationship against the alternative hypothesis, that the matrix has a complete category. We first carried out the test for the I(1) variables. Table 2 shows that the trace statistic does not allow for the rejection of all hypotheses of r cointegration relationships at a level of significance ($r = 0,1,2,3$ or 4) at 5%. Because the trace test does not allow for the rejection of the null hypothesis (zero) of the cointegration

relationship in at least one relation, we can conclude that there is no cointegration relationship between our variables.

Table 2: Cointegration test (trace statistics)

	$r = 0$	$r = 1$	$r = 2$	$r = 3$	$r = 4$
Trace stat	69.65550	38.62100	15.41105	03.609769	01.00 E-05
Critical value at 5%	69.81889	47.8561	29.79707	15.49471	03.841466

Source: Author with data derived from E-views.

Ultimately, the various tests of stationarity and cointegration of time series that comprise the VAR system reveal that all series apart from the Consumer Price Index are considered as $I(1)$, and that there is no relationship of cointegration between them. These results lead us to carry out estimations based on structural VAR.

5. Presentation and interpretation of results

5.1. Presentation of results

The main findings are presented through a result table, giving the variance-decomposition and the response function to shocks. Since our variables are not of the same order, we lagged the I(1) variables before carrying out our estimations. We estimated a I(1) VAR arriving at an optimal number of lags that were selected according to Akaike's information criterion. Table 3 presents us with the VAR estimation.

Table 3: Results of the VAR estimation

Dependent variables	PIB	IPC	DCG
R ²	089	0.39	0.96
PIB (-1)	0.694*** (5.899)	-0.000 (-0.732)	-0.080 (-1.168)
TE (-1)	-2.186*** (-0.288)	-0.028 (-0.723)	-1.803 (-0.407)
IPC (-1)	61.472* (1.838)	0.271 (1.580)	27.526 (1.407)
IPC (-1)	61.472* (0.403)	0.271 (1.245)	27.526 (-0.242)
DCG (-1)	0.327*** (3.068)	-0.000*** (-0.582)	1.112*** (17.828)

Source: Author with data derived from E-views.

NB: () stands for t-student.

***, ** and * correspond to a significance by 1%, 5% and 10%.

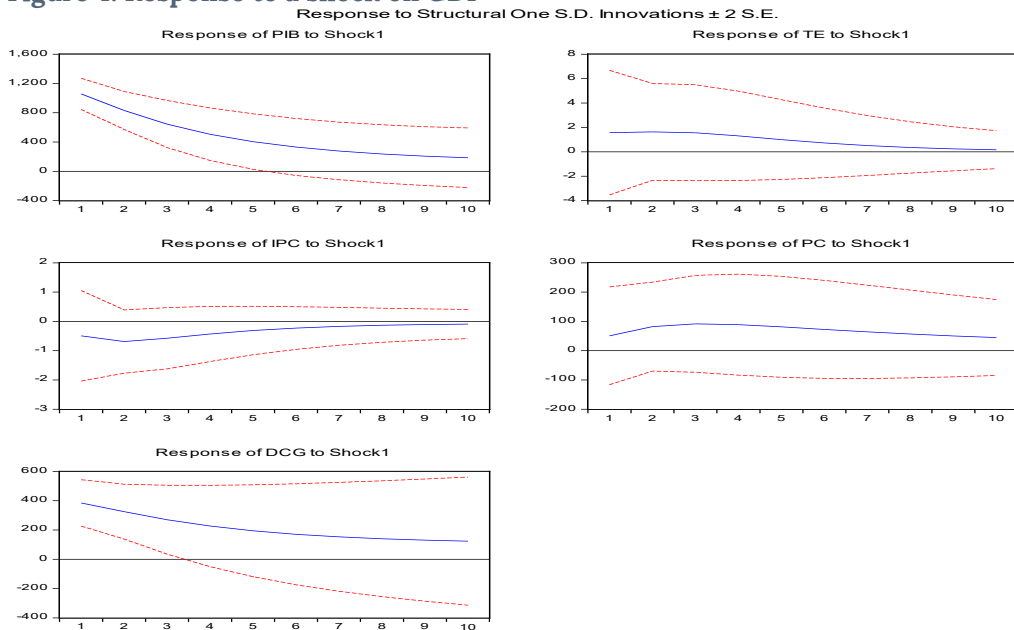
Our results indicate that the shocks on GDP play a crucial role in explaining variations in economic activities. Indeed, only the lagged values of real GDP and Final Government Consumption, following Fisher's statistics, are significant in the VAR estimation before the structural VAR modelling. However, the coefficient of lagged real GDP is the highest. The coefficients related to lagged values of other variables are insignificant. In regard to the contribution of external shocks (terms of trade and price of cocoa) to fluctuations in real GDP, they enter into the SVAR with insignificant coefficients, which leads us to believe that they do not contribute to fluctuations in the real GDP of Ivory Coast. R² of the equation of the Consumer Price

Index is low when compared to those of real GDP and government Final Consumption Expenditure. In regard to the Consumer Price Index, all variables of the model enter the structural VAR with statistically insignificant coefficients, which makes us believe that they would be very poor in explaining the level of inflation in Ivory Coast. Finally, besides the coefficient of the statistic that gives the government’s Final Consumption Expenditure, which is statistically significant, all other variables that are entered into the model are not significant.

Impulse response function

The charts in Figure 4 illustrate the responses of all variables in the system to a shock. We pay particular interest to the GDP response to a structural shock on other variables. The response functions are framed within a confidence interval determined using Monte-Carlo simulations.

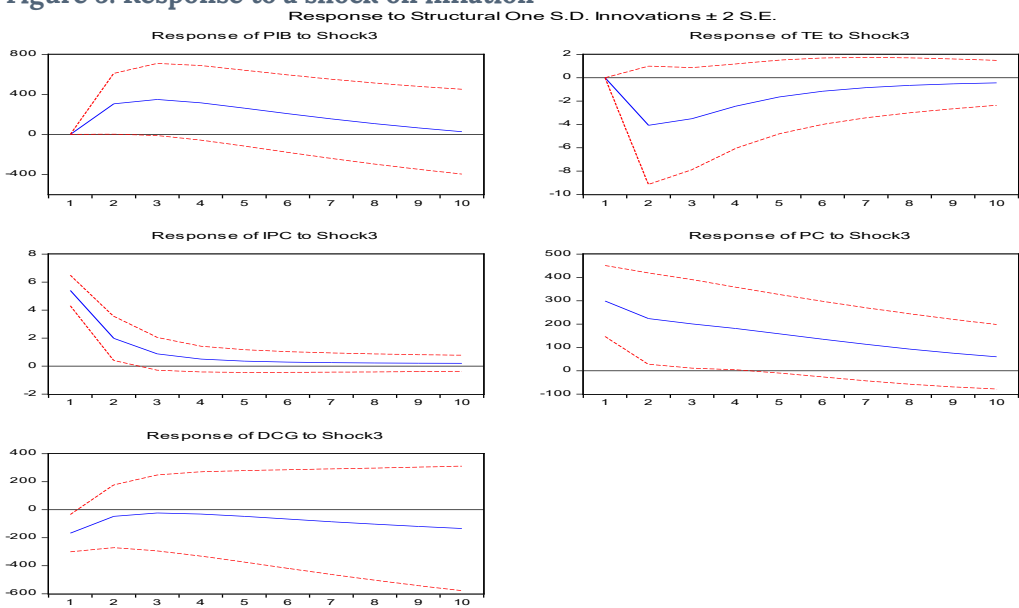
Figure 4: Response to a shock on GDP



It is clear from our estimations that shocks on real GDP have a more significant impact in terms of macroeconomic fluctuations. A positive shock in an interval of 10 periods of economic activity translates into a significant deterioration of the same through the entire period. The shock reproduces effects that are similar to household consumption expenditure, the terms of trade. A spike in inflation, that still remains under 0. This result justifies the rapid transmission of shocks that affect economic activities. A shock on activities leads to a slight decrease in terms of exchange and the price of cocoa, which explains the fact that Ivory Coast is a small economy that cannot influence international activity. This shock translates to inflation by a reaction

to the decrease in the short term [1, 2] and an increase in the rate of inflation from the second period, demonstrating the susceptibility by the Consumer Price Index to shocks that affect the activity. This shock transmission manifests itself through a decrease in inflation caused by an increase in interest rates, and consequently a decrease in investments, which leads to the persistence of inflation in the subsequent period. The increase in inflation from the second period seems to be caused by a reaction to the monetary policy that aims to lower the interest rates, which favours relaunching activities and an increase in inflation. The shock on activity reverberates on government consumption expenditure through a decrease in the latter during the entire period. Government consumption expenditure is strongly correlated to fluctuations in economic activities.

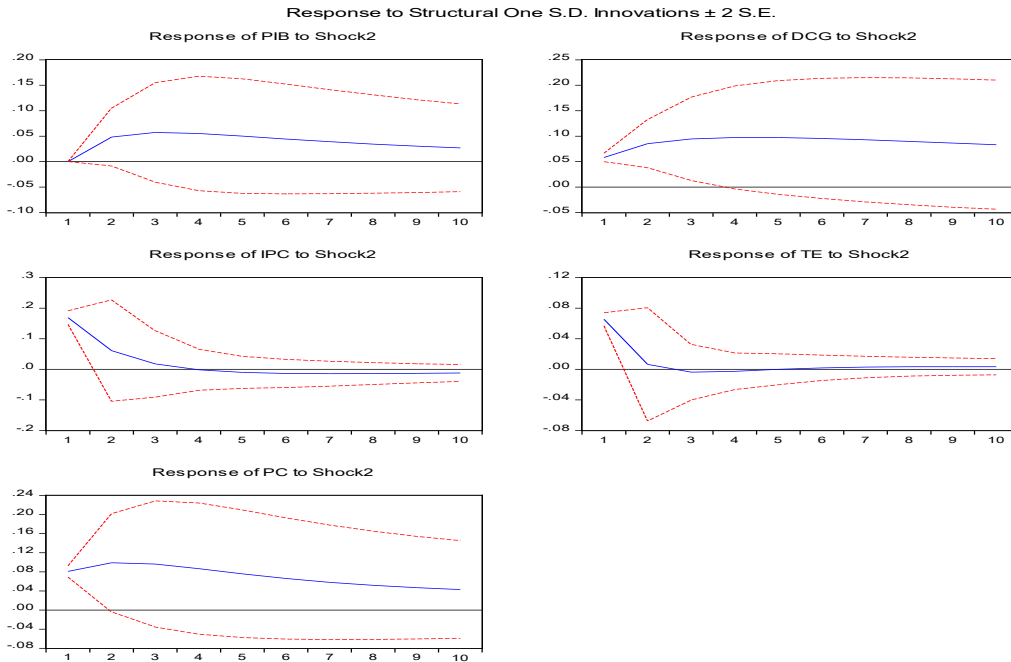
Figure 5: Response to a shock on inflation



A positive shock in the interval of 10 periods on inflation translates to negative effects, then stabilizes after the third period. Negative effects relate only to the first three periods and then stabilize over all other periods. This reduction has a crucial social impact which is manifested by an increase in purchasing power. The effect stabilizes as from the eighth period in order to generate an almost null long-term inflation rate. A positive shock on inflation is instantly transmitted to the economic activity through a positive effect. A decrease in inflation reverberates beyond the third period via the preponderance of the adverse effects on economic activities caused by a decrease in investment rates. This is explained by the wait-and-see behaviour of economic agents who are likely to reduce their investment and consumption when they are faced with an increase in interest rates. Yet investment and consumption remain the main drivers of economic growth. A positive shock on inflation impacts on terms of trade through negative effects in almost all periods, which is demonstrated by a

rapid decrease in terms of trade over periods [1, 2] and a sharp increase in interval [2, 5]. A shock in innovation of inflation generates instability in terms of trade in the midterm. The effects of shock tend to stabilize in the long term, thus confirming the hypotheses on restrictions. The price of cocoa experienced a progressive and continuous decrease at adjustment to shocks on inflation. The response in household consumption expenditure to a shock on inflation is positive in the first three periods before slightly dipping subsequently; however, all this is below zero.

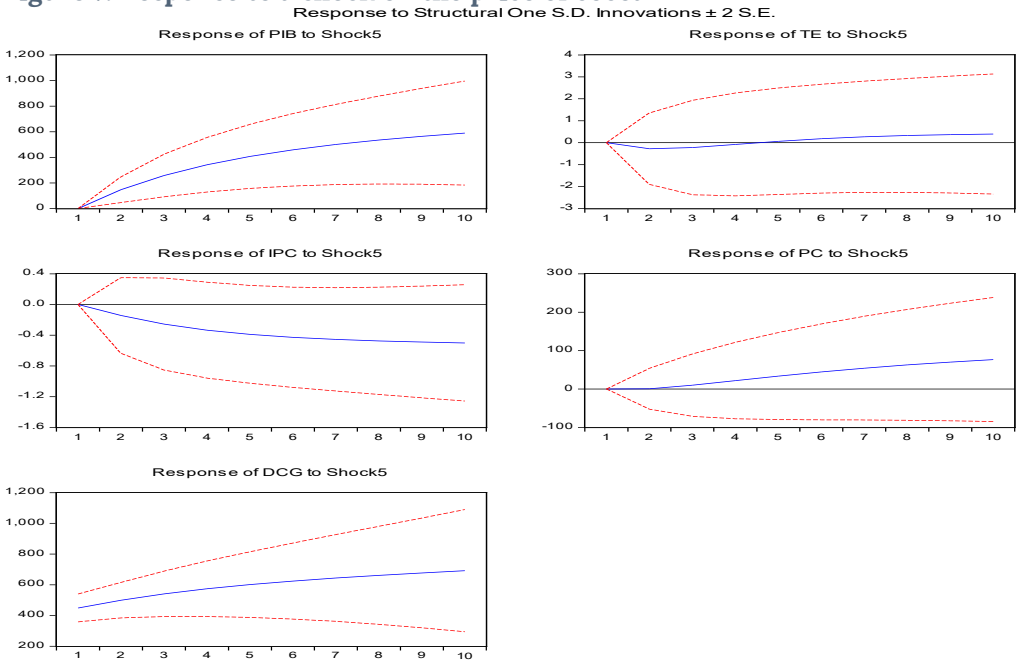
Figure 6: Response to a shock on government Final Consumption Expenditure



A positive shock with an interval of 10 periods on government Final Consumption Expenditure leads to positive effects over the entire period. This shock has a very rapid transmission interval on other variables. Dufrénot et al., (2007) argue that the positive effects can be explained in WAEMU countries by external competition that results in the financing of PPTTE expenditure.² A positive shock on government Final Consumption Expenditure translates in economic activity through positive effects in all periods. These two variables have similar effects over the entire period. Indeed, a good allocation of expenditure (investment expenditure) is likely to generate positive repercussions on economic activities. A positive effect on government Final Consumption Expenditure impacts inflation through negative effects over almost all periods, which is reflected through a decrease in the general price levels, registered over period [1, 3] and stabilizing thereafter. Inflation is correlated with fluctuations in government Final Consumption Expenditure due to the divergence of their effects over certain periods. The shock effect tends to stabilize in the long term. The response

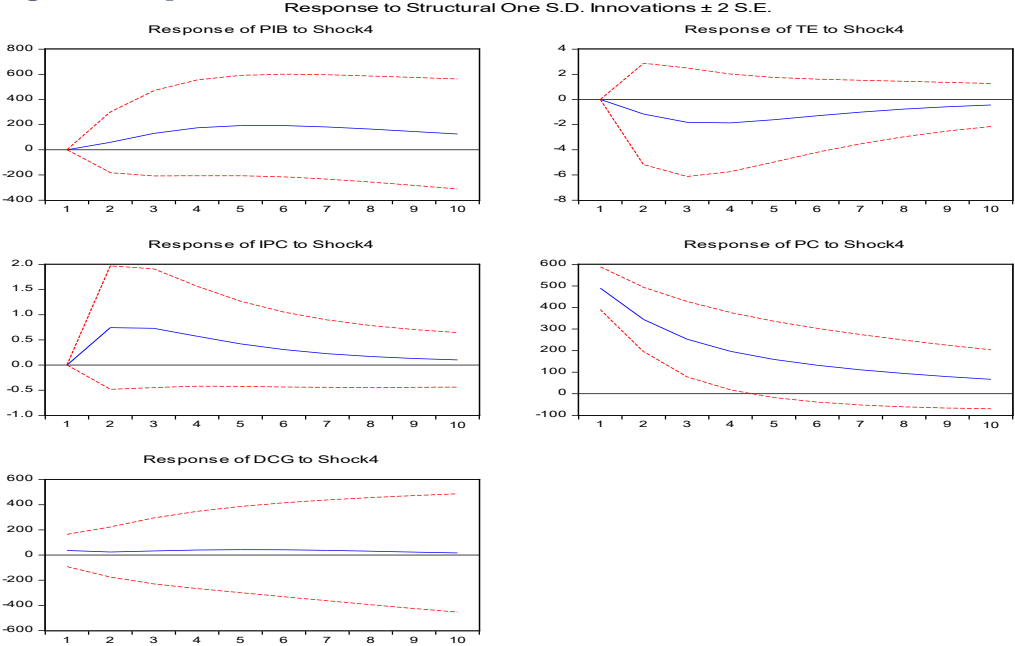
by terms of trade to a shock on consumption expenditure is by a sharp decrease over the first two periods. After that period, it becomes stable. The price of cocoa remains stable in response to government Final Consumption Expenditure.

Figure 7: Response to a shock on the price of cocoa



A positive shock with an interval of 10 periods on the price of cocoa leads to positive effects after the third period. This innovation shock is manifested by a progressive increase in the price outlook over the entire period with a very rapid transmission to production, government consumption expenditure and inflation. A positive shock on the price of cocoa impacts on economic activity through positive effects in all periods. An increase in the price of cocoa leads to a positive effect on the activity thus rapidly impacting the price of cocoa. These two variables have similar effects over various periods. A positive shock on the price of cocoa impacts on inflation through negative effects in all periods. Inflation is correlated with fluctuations in the price of cocoa due to the divergence of their effects over certain periods. An innovation shock in terms of cocoa prices generates instability in the general level of prices in the midterm. The shock in the price of cocoa leads to an increase in government Final Consumption Expenditure. An increase in the price of cocoa indicates an increase in state revenue, which leads to an increase in government Final Consumption Expenditure. The response in terms of trade to cocoa price shocks is almost zero over the entire period.

Figure 8: Response to a shock in terms of trade



A positive shock in the interval of 10 periods over the terms of trade translates into negative effects over the entire period. This reduction has a crucial social impact which is manifested by an increase in purchasing power by the state. A positive shock on the terms of trade impacts economic activity through positive effects in all periods. An increase in terms of trade leads to a positive effect on activity thus proving the fact that an improvement in terms of trade is important. A positive shock on terms of trade is automatically transmitted to inflation through an increase in inflation during the first two periods, and a decrease over the rest of the period. The increase over the first periods is explained by an increase in purchasing power. However, the lowering of inflation is more particularly related to an increase in interest rates. The shock on terms of trade has practically no effect on government Final Consumption Expenditure.

Error term decomposition

The objective is to calculate the contribution of each one of the innovations to the percentage error variance. When an innovation explains a significant percentage of the variance of the prediction error, we deduce that the economy is very sensitive to shocks affecting that series. The results, according to the study of the variance decomposition, are indicated in Table 4.

Table 4: Decomposition of the variance of prediction errors

Dependent variables	Period					
Gross Domestic Product	5	75.642	0.261	10.989	2.522	10.584
Consumer Price Index	5	3.529	1.041	90.324	4.185	0.920
Government Final Consumption Expenditure	5	21.966	0.207	1.794	0.337	75.693

Source: Author.

NB: The figures are in %.

The variance of prediction error for Gross Domestic Product is due by 75.64% to its own innovations, 0.26% to innovations in terms of trade, 10.98% to innovations of inflation, 2.52% to innovations in cocoa prices, and by 10.58% to those of government Final Consumption Expenditure. It shows that besides its own innovation, the general level of prices and government Final Consumption Expenditure act more in the short term. These variables are sensitive to shocks that affect economic activities. These results are in conformity with those obtained relating to responses following shocks on economic activities.

The variance of prediction error for inflation is due by 90.32% to its own innovations, 3.52% to innovations in economic activities, 1.04% to innovations of terms of trade, 4.18% to innovations in cocoa prices, and by 0.92% to those of government Final Consumption Expenditure. A shock on economic activity therefore has more impact upon inflation than the impact that inflation shock has on the activity. In the short term, this shock reverberates more on the prices of cocoa. This justifies the particular attention given by BCEAO on inflation, because the country could be a major source of imported inflation and this could have a negative impact throughout the union.

The variance of prediction error for government Final Consumption Expenditure is due by 75.69% to its own innovations, 21.96% to innovations in economic activities, 0.20% to innovations of terms of trade, 1.79% to innovations in inflation, and by 0.33% to innovations in cocoa prices. This result agrees with that obtained on response functions following a shock on government Final Consumption Expenditure. In the short term, a shock on government Final Consumption Expenditure has more impact on economic activity. It also reveals to us that a shock on economic activity therefore has less impact on the government's Final Consumption Expenditure than the impact a shock on consumption expenditure has on economic activity.

5.2. Interpretation

The high level of shocks of real GDP on macroeconomic fluctuations in Ivory Coast can be explained by the fragility of the basic model of economic growth. This growth is characterized by a very high dependence on agricultural raw materials for which it is a price taker, not a large-scale consumer, and on uncertainty about macroeconomic stabilization, notably after the political crisis of 1999-2011.

The relatively weak contribution of other variables to macroeconomic fluctuations demonstrates the concerns by donors on stability, notably since the implementation of Structural Adjustment Programmes (SAPs) in 1980s. Indeed, the monetary policy undertaken by the Central Bank of West African States (BCEAO) as well as the Convergence, Stability, Growth and Solidarity pact (PCSCS) adopted in 1999, only aimed at re-establishing internal and external equilibrium and at controlling pressure from inflation, but did not have any objective towards economic growth. The inadequacies of the financial system are also a reason, notably its low rate of households with bank accounts.

The significant impact of shocks on the Consumer Price Index in explaining fluctuations in price levels is due to the orientations of the monetary policies of BCEAO. Indeed, price stability in the West Africa Economic and Monetary Union (WAEMU) countries is the main objective of policy makers in the financial sector. Furthermore, the predominance of government consumption expenditure could be explained by the economic boom of the 1960s to 1978 and to credit facilities provided by the Bretton Woods institutions and bilateral partners.

In regard to external shocks, the impact of the price of cocoa and terms of trade on real GDP and the Consumer Price Index could be explained by high level of openness of the Ivory Coast economy, and also its relatively small size. The prices of cocoa are determined in the international market; the price of imports and exports of other products are also determined abroad. Indeed, imports are either of basic goods or goods that are necessary for economic growth (energy goods, intermediate goods and investment). Finally, a majority of imports and exports in Ivory Coast are concentrated in a specific geographical zone (European Union), which makes this economy particularly vulnerable to changes related to trade, thus the volatility of income and of the exchange rate.

6. Conclusion

This study examines and compares the impact of external shocks with that of internal shocks over economic cyclical fluctuations in Ivory Coast through the use of a Structural Vector Autoregressive (SVAR) model. Moreover, the analysis is carried out so as to identify the determinants of the significance of shocks on cyclical fluctuations on the country's economy.

The results demonstrate that shocks on real GDP account for a large part of cyclical fluctuations. Also, external variables included in the analysis (terms of trade and cocoa prices) have a relatively significant impact on the national economic variables aside from government consumption expenditure. They also reveal that internal shocks have more significant effects on the national economy and cyclical fluctuations than external shocks. However, the impact of external shocks on domestic variables should not be ignored because their effects are varied and could indirectly influence cyclical fluctuations.

The recommendations for economic policy formulation following this study are numerous. The main impact of shocks on real GDP, brought about by the significant impact of raw materials on economic activity calls for the diversification of Ivory Coast's production sector. Raw materials cannot guarantee a regular and sustained growth rhythm because of their dependence on market conditions. A recourse to economic diversification, the putting in place of a competitive industrial sector and the development of service segments could allow for a reduction in the exposure of Ivory Coast's economy to external shocks. More thought should be given towards constituting financial reserves. These reserves would have as an objective the provision of necessary capital resources needed to support economic activities during periods of negative shocks.

Furthermore, in order to minimize the negative effects of the drop in the prices of cocoa and the deterioration of terms of trade on the economy of Ivory Coast, the diversification of export products, destinations and gradual transformation are recommended. This diversification would allow for the alleviation of price volatility and the tightening of demand in various geographic zones so as to limit the negative impact of a drop in the prices of export goods, particularly cocoa. Gradual transformation would allow for value addition in products and increase profitability.

Notes

- 1 The index of the mean value (IV) is calculated as follows:

$$I = \frac{\sum p_t q_t}{\sum p_0 q_t} \times 100; \text{ where, } p \text{ and } q \text{ are the price and the quantity of}$$

exports and imports, respectively.

- 2 Small heavily indebted country.

References

- Al-Jawarneh, A and S. K. Sek. 2012. “The Impact of External Shocks on Business Cycle Fluctuation in Several Developed Asian Countries”. *Applied Mathematical Sciences*, Vol. 6, 2012, no. 65, 3209 – 3223
- Backus, D., P. Kehoe and F. Kydland. 1994. “The dynamics of the trade balance and of the terms of trade: The J-curve”. *American Economic Review*, 84: 84–103.
- Boschi, M. and A. Girardi. 2008. “The contribution of domestic, regional, and international factors to Latin America’s business cycle”. CAMA Working Paper No. 33/2008.
- Bormotov, M. 2009. “Economic cycles: Historical evidence, classification and explication”. MPRA Working Paper No. 19616.
- Calvo, G., L. Leiderman and C. Reinhart. 1993. “Capital inflows and the real exchange rate in Latin America: The role of external factors”. *International Monetary Fund Staff Papers*, 40: 108–150.
- Canova, F. 2005. “The transmission of U.S. shocks to Latin data”. *Journal of Applied Econometrics*, 20: 229-51.
- Dufrénot, D., E. Houessou and E. Nonfodji. 2007. *Politique budgétaire et dette dans les pays de l’UEMOA*. Economica
- Fuchs-Schundeln, N. (2008). “The response of household saving to the large shock of German reunification”. *American Economic Review*, 98(5), pp. 1798–1828
- Gimet, C. 2007. “L’impact des chocs externes dans les économies du Mercosur: Un modèle VAR structurel”. *Economie Internationale*, 110: 107-136.
- Hoffmaister, A. and J. Roldos. 2001. “The sources of macroeconomic fluctuations in developing countries: Brazil and Korea”. *Journal of Macroeconomics*, 23(1): 213–39.
- Johansen, S and K. Juselius (1990). “Maximum Likelihood Estimation and Inference on Cointegration with Applications to Demand for Money” *Oxford Bulletin of Economics and Statistics* 52, 169-210.
- Kandil, M. 2000. “Macroeconomic shocks and dynamics in the Arab world”. Paper presented at the 7th ERF conference on *Trends and Prospects for Growth and Human development*. Amman, Jordan, 26-29 October.
- Obstfeld, M. and K. Rogoff. 2004. “The unsustainable U.S. current account position revisited”. NBER Working Paper No. 10869.
- Mendoza, E. 1995. “The terms of trade, the real exchange rate and economic fluctuations”. *International Economic Review*, 36(1): 101-137.

- Mendoza, E. 1991. "Business cycles in a small open economy". *American Economic Review*, 81: 797–818.
- Raddatz, C. 2005. "Are external shocks responsible for the instability of output in low-income countries?" World Bank Policy Research Working Paper No. 3680. The World Bank, August.
- Raddatz, C. 2008. "Have external shocks become more important for output fluctuations in African countries?", in D. S. Go & J. Page (Eds.), *Africa at a turning point? Growth, aid, and external shocks* (Africa Development Essays Series). Washington, DC: The World Bank.
- Sato, K., Z. Zhang and M. McAleer. 2009. *Identifying Shocks in Regionally Integrated East Asian Economies with Structural VAR and Block Exogeneity*. CIRJE Discussion Paper No. 694. Centre for International Research on the Japanese Economy, University of Tokyo.
- Sims, C. 1980. "Macroeconomics and reality". *Econometrica*, 48: 1–48.
- Sosa, S. 2008. "External shocks and business cycle fluctuations in Mexico: How important are U.S. factors?" IMF Working Paper No. 08/100. International Monetary Fund, Washington, D.C.
- Zigui, L. 2005. "External shocks and economic fluctuations: Evidence from Tunisia". MPRA Working Paper No. 630.
- Ziky, M. and B. Mansouri. 2003. "Openness, transmission of external shocks and their effects on the Moroccan economy: Analytical and empirical approaches". Paper presented at the 10th Economic Research Forum, Marrakech, December; www.erf.org.eg.



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