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EFFECTS OF INFLATION ON IVORIAN FISCAL VARIABLES: AN ECONOMETRIC INVESTIGATION

EUGENE KOUASSI


AFRICAN ECONOMIC RESEARCH CONSORTIUM

CONSORTIUM POUR LA RECHERCHE ECONOMIQUE EN AFRIQUE

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on Ivorian fiscal variables:
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Abstract

This paper analyses the effects of inflation on Ivoiran fiscal variables by using the Aghevli-Khan model (1978) to estimate the time required for a change in the consumer price index to be fully reflected in the variables. The predictability of time-dependent adjustment coefficients is also investigated using the Kalman filter approach. Simulation experiments (e.g., temporary decrease or increase in GDP) are also used for policy implications. Estimations obtained from the study seem very useful for Côte d'Ivoire policy makers.

I. Introduction

The various problems created by inflation have significantly hindered Côte d'Ivoire's economic reform process, which began in 1980. More particularly, in the context of the West African Monetary Union, the direct linkage between the principal instruments of fiscal policy, e.g., government expenditures and revenues, and the price stabilization policy has been detrimental to fiscal policy.

The economic impacts of inflation have been discussed extensively in the literature. Some of the most common factors cited in rising inflation are the increases often associated with the cost of government services and expenditures, the amount of budgetary demands, the amount of revenues collected, debt and debt servicing.

Some researchers have previously attempted to analyse the effect of inflation on fiscal variables for selected developing regions: South and Central America, the Caribbean, Asia and Africa . The major drawback of these studies has been the broadness of their scope, i.e., the lack of specificity of the cases investigated. Other theoretical frameworks have been developed by Barro (1979), Evans (1985) and Wasserfahlen (1985) that yielded poor empirical results. Our study develops a methodology based on the Aghevli-Khan model (1978) to estimate the effects of inflation and the adjustment speeds of Ivorian fiscal variables by:

- elaborating a sound theoretical and empirical framework to assess the effects of inflation on the fiscal variables (revenues and expenditures) in Côte d'Ivoire;
- testing the accuracy of the Aghevli-Khan hypothesis in describing the fiscal experience of Côte d'Ivoire; and
- analysing the speed with which fiscal variables adjust to inflation in Côte d'Ivoire.

The study includes the following parts. Section II discusses the salient points of the inflation process and the evolution of fiscal variables in connection with inflation. Section III describes the methodology adopted, a conceptual framework that takes into account the specificities of the economy of Côte d'Ivoire. The initial model is generalized to account for the adjustment speeds (dynamic aspects). Section IV deals with empirical results and their statistical and economic interpretations. An estimation of the effects of inflation on fiscal variables and the adjustment speeds of these variables are also considered. Simulations, final remarks and conclusions are considered in the last two sections.

II. The inflation process

Before dealing with the inflation process, it would be useful to review the macroeconomic context of Côte d'Ivoire. The experience of the Ivorian economy during the last three decades provides an interesting modern case study for analysing the dynamics of inflation in the context of fixed parity with the CFA franc. The relative price stability achieved in this context in the West Africa Monetary Union after 1948 was undermined by the rapid monetary expansion resulting from the boom in commodity prices (mainly coffee and cocoa) during the period of 1976-1978 (Figure 1). The pressure on prices was also greatly exacerbated by the recent devaluation (January 1994) of the CFA franc. Government expenditures increased in nominal terms, but declined substantially in real terms.

In the months and years of high inflation, the government increased expenditures in real terms, even as revenues in real terms declined steeply. The decline in revenues was a direct consequence of high inflation, given the structure of taxation and the method of collection tax in Côte d'Ivoire. On the other hand, the main elements in the dynamics of the accelerating phase of Ivorian inflation emerge from the link between the inflation process and the fiscal deficits, the credit policy and the monetary expansion (Figure 2).

Price increases were initiated, and began to be aggravated, by rising government expenditures and their direct effect on food supplies and prices. Since government revenues lagged substantially behind price increases, the authorities were forced to finance their deficits by the creation of money and by borrowing. This self-perpetuating process caused inflation to spiral higher and higher; it has reached the stage of near hyperinflation since 1994.

An explanation of the budgetary problems in Côte d'Ivoire is mapped in Figures 3 and 4, which illustrate the evolution of expenditures and revenues. It is shown that the revenues fluctuate, with marked changes from the horizontal line in the function of the level of international prices. The ratio between global revenues and GDP was of 4.18% in 1975, 33.93% in 1978, 27.66% in 1982 and 23.25% in 1989. Two factors, interior and external fiscality, essentially explain the evolution of tax revenues.

The evolution of expenditures, on the contrary, has demonstrated a consistent yearly increase, associated with large fluctuations from one year to the next. The ratio between the global government wage bill and the total non-investment budget is 60%.

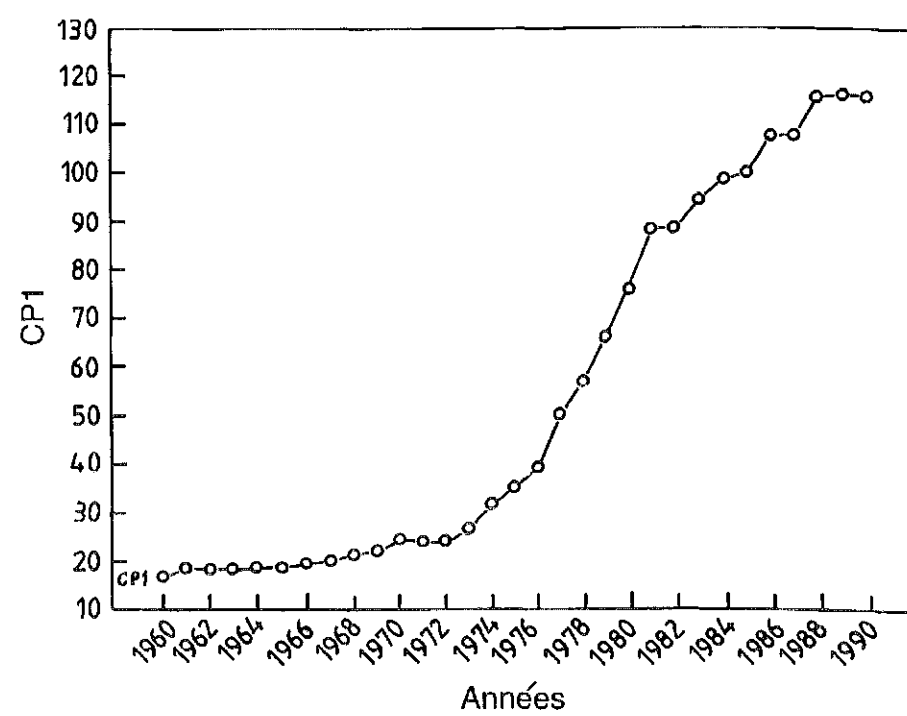
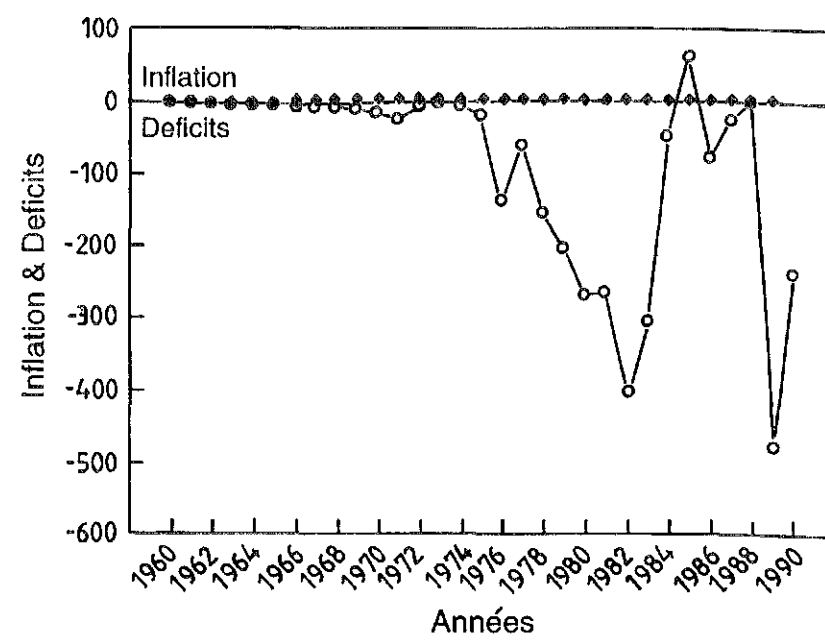
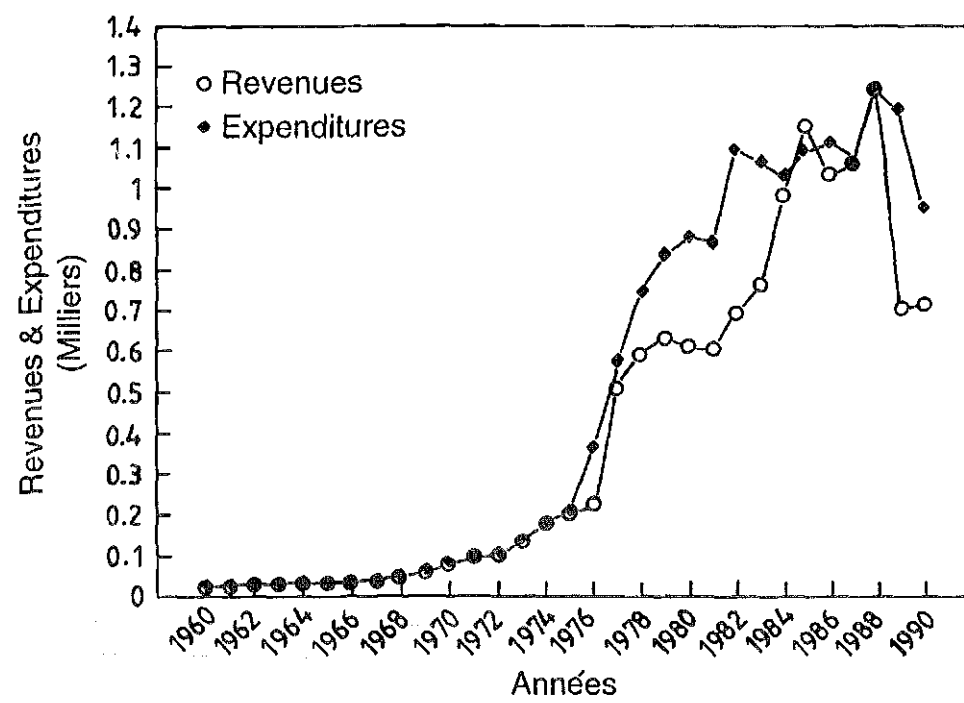
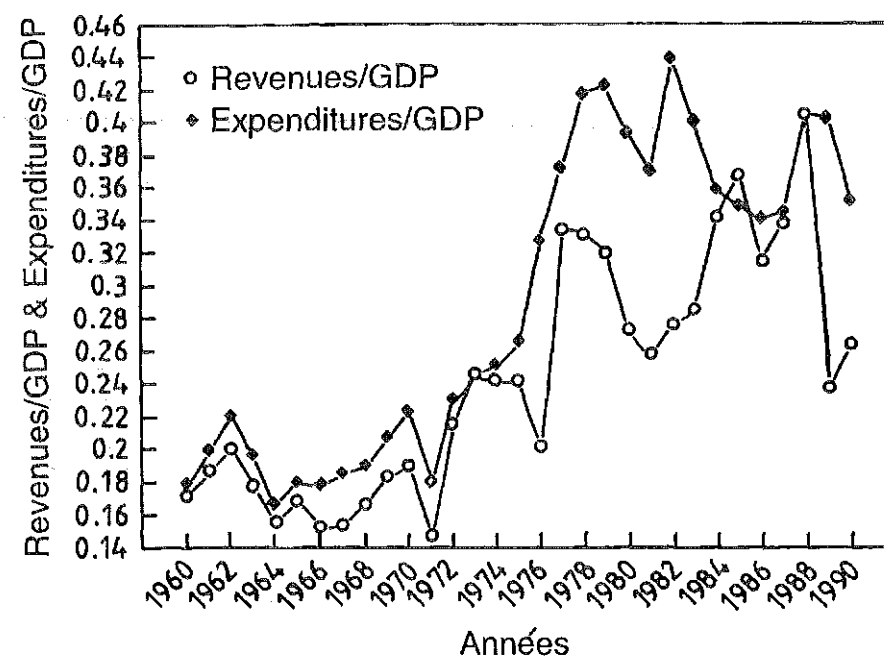
Figure 1: Evolution of CPI**Figure 2:** Inflation and fiscal deficits

Figure 3: Evolution of revenues and expenditures**Figure 4:** Evolution in % of GDP

When taking into account the rate of inflation, preliminary results show that:

- the ratio between revenues and GDP was 34% in 1975, 47% per cent in 1978, 27% in 1982, 28.3% in 1985 and 26% in 1990; and
- the ratio between expenditures and GDP was 34% in 1975, 47% in 1978, 40.3% in 1985 and 40% in 1990.

In the first approximation, inflation appears to have increased the wedge between revenues or expenditures and GDP. In the next section, the study scrutinizes the effects of inflation on Ivorian fiscal variables as well as the speeds of adjustment in response to inflation.

III. The Aghevli-Khan model

As stated previously, the present methodology relies on the Aghevli-Khan (1978) model described next. Heller (1980), while attempting to determine the actual net fiscal response to inflation, raised three important questions: 1. How do policy makers adjust the desired level of nominal expenditure and revenue to a change in the price level in Côte d'Ivoire? 2. How rapidly are such adjustments reflected in decisions pertaining to actual expenditure (or revenue) level? 3. What are the constraints or factors that determine the relative speed of such adjustments?

Within the Aghevli-Khan model, only the first two questions are formally addressed. The last question can find answers using simple economic and social analyses of the Ivorian budgetary environment (structure of revenues and expenditures, and the perceived cost of adjustment mechanisms) to try to point out specific factors influencing the responses of expenditures and revenues.

Description

In its extended form, the model developed by Aghevli and Khan (1977, 1978) is based on equations for four factors: price, government expenditures, revenue and money supply. These are described below.

Price equations

The demand for money is specified as follows:

$$\log (M/P) = a_0 + a_1 \log Y_t - a_2 \Pi_t \quad (1a)$$

$a_1, a_2 > 0$

where:

M	=	stock of nominal money balances
P	=	price level
Y	=	level of real income
Π_t	=	expected rate of inflation

Assuming that prices adjust to the excess demand for money, adjustment of actual stock or real balances to the desired level is specified as:

$$\Delta \log(M/P)_t = K[\log(M/P)_t^D - \log(M/P)_{t-1}] \quad (1b)$$

where: $0 < k < 1$ is the stock adjustment coefficient.

The expected rate of inflation is generated by an adaptive expectation scheme specified as:

$$\Pi_t = \lambda DP_t + (1-\lambda)\Pi_{t-1} \quad (1c)$$

where: λ = coefficient of expectation
 DP_t = current rate of inflation

Government expenditures equations

Desired real government expenditure is specified as:

$$\log(G/P)_t^D = g_0 + g_1 \log Y_t \quad (2a)$$

$g_1 > 0$, g_1 is defined as the real income elasticity of expenditure.

Expenditures also follow a stock adjustment process, which is specified as:

$$\Delta \log(G/P)_t^D = v[(\log(G/P)_t^D - \log(G/P)_{t-1})] \quad (2b)$$

where: $0 < v < 1$ is the adjustment stock.

Government revenues equations

Desired government revenue is specified as a function of nominal income.

$$\log(R)_t^D = t_0 + t_1 [\log(Y_t) + \log(P_t)] \quad (3a)$$

$t_1 > 0$, t_1 is defined as the elasticity of revenues.

The adjustment process between desired and actual revenue levels is defined by:

$$\Delta \log R_t = \tau[\log R_t^D - \log R_{t-1}] \quad (3b)$$

where: $0 < t < 1$ is the adjustment coefficient of revenue.

Money supply equations

From the consolidated banking system balance sheet, the asset side is taken to present the money supply identity:

$$M_t = NFA + CG + CP + O \quad (4a)$$

where: NFA = net foreign assets

CG = claims on government
 CP = credit to the private sector
 O = other assets.

In terms of changes, we have:

$$\Delta M_t = \Delta NFA + \Delta CG + \Delta CP + \Delta O \quad (4b)$$

In the most general case, government borrowing from the central bank is for financing the budget deficit. We can therefore equate the difference between revenue levels to the change in claims on government:

$$\Delta CG = G - R \quad (4c)$$

Substituting Equation 4c into Equation 4a gives:

$$\Delta M_t = \Delta NFA + (G - R) + \Delta CP + \Delta O \quad (4d)$$

According to the general framework of the model, the coefficients of interest are: v , τ , t_i and g_i .

Note that the average time lags are, respectively:

- money demand = $(1 - k)/k$
- government expenditure = $(1 - v)/v$
- government revenue = $(1 - t)/t$

We also suppose that the nominal deficit will be a function of the increase in the price level, provided τ is less than v , even though $t_i = g_i$.

An alternative formulation

In practice, equations 2a and 2b and 3a and 3b can be estimated using the reduced form.

Suppose that in Equations 2b and 3b τ and v are directly linked to the rate of inflation

and the acceleration process (deceleration, respectively) in the inflation process. Then, the Aghevli-Khan model can be rewritten as follows:

$$\begin{aligned}\log(G/P)_t^D &= g_0 + g_1 \log(Y_t), g_1 > 0 \\ \log R_t^D &= t_0 + t_1 (\log(Y_t) + \log(P_t)), t_1 > 0\end{aligned}$$

When Equations 2a and 3a are differentiated, we obtain:

$$\Delta \log(G/P)_t = v[\log(G/P)_t^D - \log(G/P)_{t-1}] \quad (2b)$$

$$\Delta \log R_t = \tau[\log R_t^D - \log R_{t-1}] \quad (3b)$$

we suppose that: $0 < v < 1$, $0 < \tau < 1$ and $v > \tau$.

Taking into account the fact that:

$$\Delta \log(G/P)_t = [\log(G/P)_t - \log(G/P)_{t-1}]$$

and substituting Equation 2a into Equation 2b gives:

$$\log(G/P)_t = v g_0 + v g_1 \log Y_t + (1-v) \log(G/P)_{t-1} \quad (4)$$

Otherwise, consider the fact that:

$$\Delta \log R_t = [\log R_t - \log R_{t-1}]$$

and substituting Equation 3a into Equation 3b gives :

$$\log R_t = \tau_0 + \tau_1 (\log Y_t + \log P_t) + (1-\tau) \log R_{t-1} \quad (5)$$

The fundamental hypothesis of the model is that expenditure tends to adjust to its desired level more rapidly than revenue, or that $v > \tau$. The model also supposes that the long-term income elasticities of expenditure and revenue, g_1 and t_1 , respectively, are not necessarily close to unity. The effects of the factors v and τ may be tested, assuming that they are time-dependent:

$$v_t = \alpha_1 v_{t-1} + \alpha_2 i_t + \alpha_3 \Delta i_t \quad (6)$$

$$\text{and} \quad \tau_t = \beta_1 \tau_{t-1} + \beta_2 i_t + \beta_3 \Delta i_t \quad (7)$$

where $i_t = \Delta \log P_t$ is the rate of inflation in the t year and Δi_t is assumed to measure the acceleration or deceleration in the inflation rate since the previous year. Substituting

Equations 6 and 7 into Equations 4 and 5 yields estimating equations in the form:

$$\Delta \log (G/P)_t = (\alpha_1 v_{t-1} + \alpha_2 i_t + \alpha_3 \Delta i_t) (g_0 + g_1 \log Y_t - \log (G/P)_{t-1}) \quad (8)$$

$$\Delta \log R_t = (\beta_1 t_{t-1} + \beta_2 i_t + \beta_3 \Delta i_t) (t_0 + t_1 \log (Y/P_t) \log R_{t-1}) \quad (9)$$

Another issue considered in the model is that the speed of adjustment to inflation is determined by whether the inflation rate has been anticipated. The model in Equation 2a is therefore rewritten in such a way that desired nominal expenditure in a period, G_t^D , is a function of the price level in that period, viz.,

$$\log(G)_t^D = \log P_t + g_0 + g_1 \log Y_t \quad (10)$$

$$\text{or} \quad G_t^D = G^D(P_t, Y_t) \quad (10a)$$

If the expected price level P differs from the actual price level that is realized, P_t^e , we will have $G_t^D(P_t^a) > G_t^D(P_t^e)$ if $P_t^a > P_t^e$. The change in actual nominal expenditures between t and $t-1$ is assumed to reflect both an adjustment of $u_1\%$ of the difference between $G_t^D(P_t^e)$ and G_{t-1} , reflecting the response to anticipated inflation, and $u_2\%$ of the difference between $G_t^D(P_t^a)$ and $G_t^D(P_t^e)$, reflecting the response to the unanticipated inflation during the period:

$$\Delta \log G_t = v_1 (\log G^D(P_t^e) - \log G_{t-1}) + v_2 (\log G^D(P_t^a) - \log G^D(P_t^e)) \quad (11)$$

Analogously,

$$\Delta \log R_t = \tau_1 (\log R^D(P_t^e) - \log R_{t-1}) + \tau_2 (\log R^D(P_t^a) - \log R^D(P_t^e)) \quad (12)$$

Combining Equations 10 and 11 and Equations 3a and 12, respectively, we obtain:

$$G_t = v_1 g_0 + (1 - v_1) \log G_{t-1} + v_1 \log P_t^e + v_1 \log P_t^a + v_1 g_1 \log Y_t \quad (13)$$

$$\text{and} \quad \log R_t = v_1 t_0 + (1 - \tau_1) \log R_{t-1} + \tau_1 t_1 \log (Y_t P_t^e) + \tau_2 t_1 \log (P_t^a / P_t^e) \quad (14)$$

The expected rate of inflation is obtained by:

$$\Pi_t = \frac{P_t^e}{P_{t-1}} = \beta \Delta \log P_t + (1 - \beta) \Pi_{t-1} \quad (15)$$

IV. Empirical results

Estimating and testing for the effects of inflation

The model estimated can be summarized as follows:

Table 1: Specification of the model

Prices: $\log (M/P) = a_0 + a_1 \log Y_t + a_2 \pi_t$

Government expenditures: $\log (G/P) = v g_0 + v g_1 \log Y_t + (1-v) \log (G/P)_{t-1}$

Government revenues: $\log R_t = \tau t_0 + \tau t_1 (\log Y_t P_t) + (1-\tau) \log R_{t-1}$

Expected inflation: $\Delta \pi_t = \lambda [P_{t-1} - \pi_{t-1}]$

Money supply: $M_t = NFA + CG + CP + O$

Real money balances: $m_t = M/P_t$

This model was identified using linear homogeneous restrictions and order and rank conditions. Since the same expected inflation and price equations appear in the different equations, the criterion of efficient estimation requires the imposition of appropriate across-equation restrictions.

This is accomplished by employing a full information maximum likelihood (FIML) estimator that allows non-linear constraints to be placed on parameters both within and across equations. The FIML estimation method that is used, however, requires that the model be linear in variables. For estimation purposes, and for analysing questions of the dynamic stability of the model, the money identity can be approximated (e.g., Khan and Knight, 1983) by the relationship:

$$\begin{aligned} \gamma_1 \log M_t = & \log M_{t-1} + \gamma_2 [\log \varepsilon_t + \log R_t] - \gamma_3 [\log E_{t-1} + \log R_{t-1}] \\ & + \gamma_4 \log DC_t - \gamma_5 \log DC_{t-1} + \gamma_6 \end{aligned} \quad (16)$$

where: DC = domestic credit,

ε_t = exchange rate per units of domestic currency per unit of foreign currency.

Table 2: Parameter estimates

Parameters	Estimates	T-Value
<i>Prices</i>		
Money demand		
Adjustment	$\lambda = 0.0015$	2.918
Income elasticity	$a_1 = 0.413$	4.156
Expected inflation	$a_2 = 5.127$	-4.503
Constant	$a_0 = 5.272$	4.217
V N ratio	$= 2.158$	
Residual sum	$= 0.016$	
Residual variance	$= 0.0212$	
Sum of absolute errors	$= 3.0538$	
<i>Government expenditures</i>		
Adjustment	$v = 0.999$	10.200
Income elasticity	$g_1 = 0.565$	5.9180
Constant	$g_0 = 2.206$	2.404
V N ratio	$= 2.085$	
Residual sum	$= -0.035$	
Residual variance	$= 0.0044$	
Sum of absolute errors	$= 1.453$	
<i>Government revenues</i>		
Adjustment	$t = 0.964$	14.677
Income elasticity	$t_1 = 0.809$	11.277
Constant	$t_0 = 1.680$	0.4085
V N ratio	$= 0.325$	
Residual sum	$= -0.036$	
Residual variance	$= 0.0217$	
Sum of absolute errors	$= 3.501$	

The constant terms in each equation were not constrained, and are thus reported in their composite forms. To give some idea of the goodness of fit of each of the equations, the respective Von Neumann ratio (VN ratio), the residual variance, the residual sum and the sum of absolute errors, and the corresponding variances of the dependent variables (s_y^2) are presented. The corresponding R^2 are not reported since, in simultaneous estimation, the R^2 is bounded $(-\infty, 1)$ and not bounded $(0, 1)$.

In this table, the variance of the level of the dependent variable estimated equation is presented with some statistics of goodness-of-fit (VN ratio, residual sum, residual variance, sum of absolute errors).

Finally, given that the model is dynamic and involves feedback, it's important to investigate for its asymptotic stability. For this reason, the eigensystem of the estimated model was calculated. All the modules are less than unity and therefore the estimated model can be considered dynamically stable. But the stability of the system is apparently sensitive to the parameters in the prices equation.

The coefficients of adjustment are positive and lie between 0 and 1. The sign of the elasticity of revenues agrees with our expectation; this elasticity is $t_1 = 0.809$ and is statistically significant. The elasticity does not exceed one and suggests that with an increase in the price level, decision makers desire an increased real tax burden, even if the real income remains unchanged. The sign of the elasticity of expenditures also agrees with expectations and is $g_1 = 0.565$, which implies that decision makers desire an increased real burden if the price level increases, *ceteris paribus*.

While this may be the effects of inflation on a given tax system, it is obvious that it may not reflect the objectives of the government since the relative change in expenditures is comparatively less important than the relative change in revenues. The Aghevli-Khan hypothesis that expenditures adjust more rapidly than revenues seems valid even in the case of Côte d'Ivoire. The model is also accurate in the estimation of the adjustment coefficients since across and within restrictions have been imposed on the structural parameters and on adjustment speeds for convergence reasons.

These results can be interpreted in the sense that when inflation is becoming important, the decision makers would like to adjust the levels of the budget; but the adjustment is such that expenditures adjust more rapidly than revenues. It is also important to notice that Côte d'Ivoire decision makers adjust the levels of expenditures as soon as they see that inflation is becoming more and more important. In Côte d'Ivoire, these adjustments suppose some budgetary restrictions, in the absence of transfers and other taxes.

Estimating time-dependent speeds of adjustment

To investigate the predictability of the speed of adjustment to inflation, the Kalman filter has been used. The method used to that purpose is the "prediction-correction" method of the Kalman filter.

The two systems of equations estimated are:

$$(I) \quad \begin{cases} \tau_t = \beta_1 \tau_{t-1} + \beta_2 i_t + \beta_3 \Delta i_t \\ \Delta \log R_t = \tau_t \cdot Z_{1,t}, \text{ with } Z_{1,t} = (t_0 + t_1 \log(Y_t P_t) - \log R_{t-1}) \end{cases}$$

and

$$(II) \quad \begin{cases} v_t = \alpha_1 v_{t-1} + \alpha_2 i_t + \alpha_3 \Delta i_t \\ \Delta \log(G/P)_{t-1} = v_t Z_{2,t}, \text{ with } Z_{2,t} = (g_0 + g_1 \log Y_t - \log(G/P)_{t-1}) \end{cases}$$

with the restrictions:

$$0 < v_t < 1, 0 < \tau_t < 1 \text{ and } v_t > \tau_t$$

where:

$$\begin{aligned} \tau_t &= \text{time-dependent revenue adjustment coefficient} \\ v_t &= \text{time-dependent expenditure adjustment coefficient} \\ i_t &= \Delta \log P_t, \Delta i_t = \Delta^2 \log P_t \end{aligned}$$

Estimations of systems I and II were carried out using the Kalman filter. The filters were initialized using a diffuse prior, i.e., $\tau_0 = 0, v_0 = 0$

$$\text{and } \sum^{v_0} (\text{resp. } \sum^{\tau_0}) = xI_k, \text{ where } x = 10^4$$

and $I_k = 1$ the variance

Preliminary results were not satisfactory. We decided to impose restrictions on coefficients, i.e., $\alpha_t = \beta_t = 1$. Results are summarized as follows:

$$\tau_t = 0.0026 + \tau_{t-1} + 1.41 i_t - 0.943 \Delta i_t$$

(3.614) (0.9392)

$$v_t = -0.045 + v_{t-1} + 0.881 i_t - 1.45 \Delta i_t$$

(3.502) (3.236)

(t in parentheses)

These results have been used to forecast t_t and u_t :

Years	t_t	MAE	MSE	RMSE
1991	0.854	0.0675	0.041	0.173
1992	0.991	0.0041	0.0376	0.1654
1993	0.953	0.0153	0.0275	0.1873
Years	u_t	MAE	MSE	RMSE
1991	0.998	0.783	0.057	0.1699
1992	0.997	0.00513	0.0438	0.1532
1993	0.998	0.00431	0.0371	0.1843

Note: The estimation procedure of time-dependent adjustment coefficients has used the method of signal decomposition developed by Kalman (1960). To evaluate the forecast's performance we have analysed the bias (ME or mean error) and the accuracy of the model using three statistics based on the errors (i.e, MAE or mean absolute error, MSE or mean square error, RMSE or root mean square error). The biases are close to zero and the other statistics indicate a high accuracy of the model in the prediction of the time-dependent adjustment coefficients.

V. Simulations

This section considers the impact of GDP policy shocks on the Ivorian economy, using the point estimates of the parameters presented in the previous section. A baseline case is obtained, and deviations of the path of the economy from the baseline in response to changes in policy variables are analysed.

Temporary decrease in GDP of 10%

The effects of a fully expected 10% decrease in GDP on the budget of Cote d'Ivoire are shown in Figure 5. The decrease in GDP, by increasing the initial budget deficit, has an immediate direct effect on the budget. The elasticities of revenues ($t_1 = 0.891$) and expenditures ($g_1 = 0.6012$) increase in general. This raises money demand in the current year and increases real excess balances, partly offsetting the direct positive impact of higher government spending.

Figure 5a: Effect on revenues

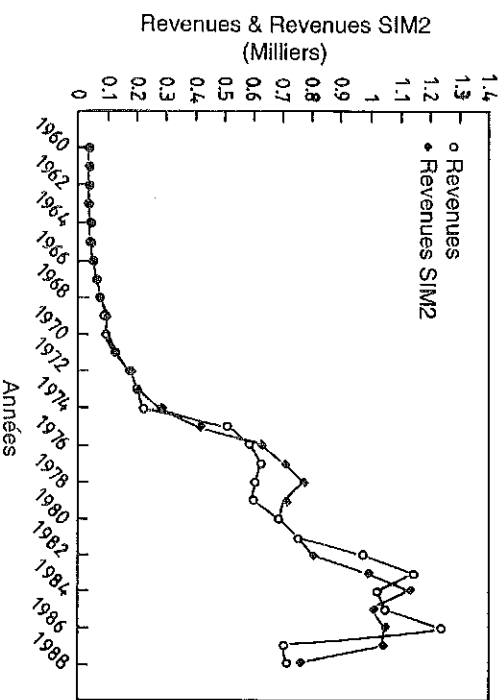
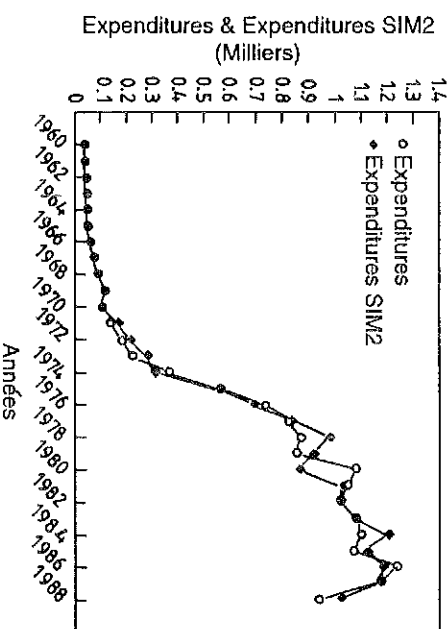


Figure 5b: Effect on expenditures

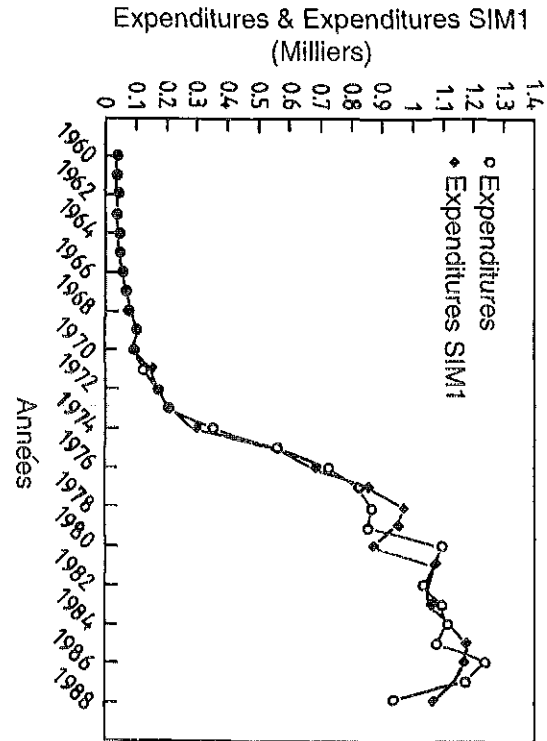
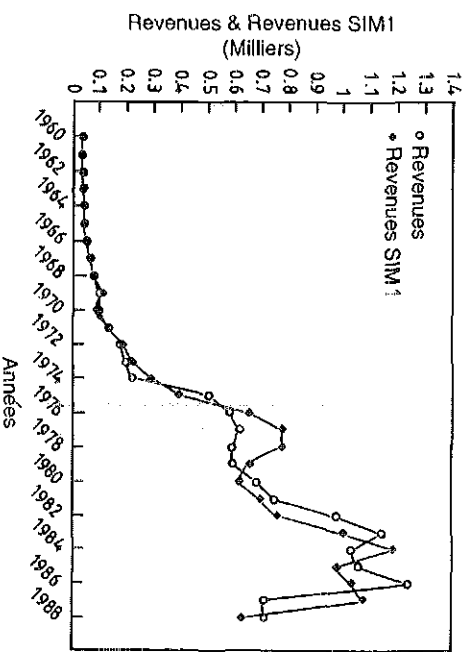


Temporary increase in GDP of 10%

Finally, we consider the impact of a fully expected increase in GDP of 10% (Figure 6). The immediate impact of an increase in GDP is a rise in the revenues ($t_1=0.8782$) and expenditures ($g_1=0.573$) of the government budget. The important lesson to be considered here is that in the case of either increase or decrease of the GDP, the government would like to increase its revenues and expenditures but with different proportions. Although it is difficult to discern unidirectional causality effects (or feedback) in the studies mentioned above, the simulation exercises reported in this paper seem to corroborate to some extent the empirical regularities discussed by the World Bank and the IMF regarding sustainable growth in Cote d'Ivoire. They suggest economic and social measures that could have some direct and immediate impacts on the budget deficits.

Figure 6a: Effect on revenues

Figure 6b: Effect on expenditures



VI. Summary, conclusions and extensions

The purpose of this paper has been to develop, estimate and simulate a macro-econometric model for Cote d'Ivoire. The parameter estimates have been used to analyse the effects of alternative GDP policy measures on the country's economy.

This model has been successful for Cote d'Ivoire. The key policy implications of the model can be summarized as follows. First, Cote d'Ivoire decision planners adjust the levels of revenues and expenditures when inflation is becoming more and more important. The basic hypothesis was that, while government expenditures rise concomitantly with inflation, government revenues tend to fall behind in real terms owing to collection lags. The financing of this inflation-induced deficit would then increase the money supply and generate further inflation. The second major implication of the model relates to time-dependent adjustment speeds. In general in Cote d'Ivoire, expenditures adjust more rapidly than revenues.

Finally, although the framework developed in this paper provides many insights, there are several areas in which further work is both necessary and desirable. The estimation results do not provide strong support regarding the existence of policy-induced disequilibrium between revenues and expenditures. The demand for money in the Aghevli-Khan model does not account for interest rates and exchange rates (portfolio selection) or terms of trade. Finally, there is a strong reason to develop an extension of the Aghevli-Khan model in order to incorporate the determinants of revenue in the overall model.

Appendix

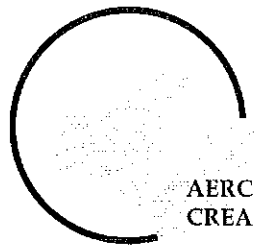
Revenues, expenditures and CPI for Cote d'Ivoire 1960-1990 (in billions FCFA)

Years	Revenues	Expenditures	CPI	GDP
1960	23.2	24.0	16.7	133.92
1961	28.4	30.2	18.8	151.63
1962	31.8	34.9	18.4	158.10
1963	33.2	36.5	18.6	186.40
1964	35.0	37.3	18.7	225.68
1965	38.0	40.6	18.9	225.40
1966	38.5	44.5	20.0	251.60
1967	40.9	49.2	20.4	266.40
1968	52.7	60.0	21.5	317.20
1969	65.1	73.1	22.5	353.90
1970	76.1	89.7	24.6	402.30
1971	93.5	114.0	24.2	636.20
1972	100.1	106.4	24.3	466.10
1973	136.6	136.5	27.0	559.10
1974	177.6	184.5	31.7	739.00
1975	201.8	220.4	35.3	836.50
1976	224.8	362.7	39.5	1116.00
1977	511.6	568.0	50.4	1539.20
1978	588.0	737.9	56.9	1782.80
1979	625.5	826.4	66.4	1964.90
1980	605.1	869.9	76.1	2222.00
1981	597.3	857.0	88.2	2323.20
1982	688.0	1089.0	88.9	2492.90
1983	754.0	1057.0	94.2	2652.90
1984	967.0	1024.0	98.2	2869.30
1985	1149.0	1086.0	100.0	3136.80
1986	1026.0	1104.0	107.3	3266.30
1987	1052.0	1138.0	107.7	3117.70
1988	1243.0	1242.3	115.3	3067.10
1989	702.0	1180.0	116.1	2951.60
1990	711.4	945.7	115.66	2702.30

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AFRICAN ECONOMIC RESEARCH CONSORTIUM

P.O. BOX 62882
NAIROBI, KENYA

TELEPHONE (254-2) 228057
225234 215898 212359
332438 225087

TELEX 22480

FAX (254-2) 219308

E-MAIL acrc@elci.gn.apc.org
or acrc@form-net.com

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