

Does Budget Deficit Crowd Out Private Investment? Cote d'Ivoire As A Focus

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Abstract

This study examines the impact of budget deficit on private investment in Cote d'Ivoire. It uses data from 1975 to 2022. Using the autoregressive distributed lag approach, the results disclose a negative relationship between deficit and private investment, providing support to the crowding out hypothesis. This suggests that high deficits driven by government expenditure slow down private investment. Estimating a threshold model, the results confirm the significance of a nonlinear relationship between deficit and private investment. The results indicate that budget deficit lower than 2.3% of GDP is positively associated with private investment. However, once the budget deficit exceeds this threshold, it turns to be neutral to private investment. Since 2020, the budget deficit is higher than the threshold of 2.3%. Therefore, policy-makers are advised to take measures reducing deficit at a level conducive to investment and economic growth. Government should improve tax revenue and restrain the growth of public expenditure while enhancing its efficiency.

Keywords: budget deficit, private investment, crowding out effect, threshold, Cote d'Ivoire

1. Introduction

Over the last decades, economists seemed to have reached a common belief that excessive budget deficits are detrimental to economic growth. An increase in budget deficit leads to an increase in government demand for loanable funds from the private sector. As public sector enters in competition with the private sector for these funds, interest rates increase and private investment is crowded out. However, empirical literature provides no conclusive findings in this regard as it documents favorable effects (Bahmani-Oskooee, 1999; Akber et al., 2020; Kalugalla et al., 2020) and adverse effects (Madni, 2013; Biza et al., 2015; Mose & Keino, 2017) associated with deficits. There are studies that have failed to find any significant effect of deficit on investment and economic growth (Edame & Okoi, 2015; Van & Sudhipongpracha, 2015; Akamobi & Unachukwu, 2021). Despite this mixed evidence, budget deficits are seen as responsible of various evils hitting developing countries (Easterly & Rebelo, 1993). These evils include high inflation and interest rates, unemployment, over indebtedness, low investment and economic growth rates, and balance of payment imbalance.

This study examines the relationship between budget deficit and private investment in Cote d'Ivoire, a member country of the West African Economic and Monetary Union (WAEMU). WAEMU has adopted fiscal convergence rules among which the budget deficit may not exceed 3% of GDP. The main aim of this criterion is to control budget deficits to ensure high economic growth at the national and regional levels. This suggests that beyond a threshold of 3%, budget deficit crowds out private investment and slows down economic growth. Evidence from the recent decade indicates that majority of the WAEMU members including Cote d'Ivoire failed to satisfy this criterion. Cote d'Ivoire consistently has experienced budget deficits over time. The overall budget deficit widened from 1.62% of GDP in 2013 to 5.6% in 2020 and reached 6.9% in 2022. This fiscal path shows that government expenditure is structurally greater than revenue. The deficit is driven by high government spending combined with low tax revenue. The Ivorian government is working to cap the deficit to 3% by 2025. After the execution of two National Development Plans (PND) over the periods 2012-2015 and 2016-2020, which resulted in an average economic growth rate of 7.4% from 2012 to 2020, Cote d'Ivoire envisions to become a unified country by 2030. The current National Development Plan for the period 2021-2025 aims to transform Cote d'Ivoire into a middle income country. This vision calls for increasing the role of the private sector in improving economic growth and jobs. This Plan targets a total investment rate representing 25.1% of

GDP in 2023 and 27.1% in 2025. The private investment rate is expected to reach at least 18.5% in 2023 and 20.5% in 2025. Subsequently, economic growth rate is expected to record 7.6% over the period 2021-2025. Accordingly, unrevealing factors driving private investment becomes critical because it might help Cote d'Ivoire to design and implement policies for sustainable economic development.

The present study addresses the following research questions. Does budget deficit influence private investment in Cote d'Ivoire? Is there a crowding out effect of budget deficit on private investment? Is there a threshold level of budget deficit beyond which private investment is crowded out? We hypothesize that budget deficit contributes to increase private investment rate in Cote d'Ivoire but beyond a threshold it crowds out private investment. To the best of our knowledge there is no known study investigating the threshold effect of budget deficit on private investment in Cote d'Ivoire. All existing studies examining the interplay between budget deficit and private investment rely on linear models ignoring the nonlinear macroeconomic effects associated with fiscal policy.

The structure of the paper is organized as follows. Section 2 analyzes the historical trends of budget deficit and private investment in Cote d'Ivoire. Section 3 presents the literature review regarding the effects of budget deficit on private investment. Section 4 outlines the model specification and the estimation strategy adopted to achieve the objectives of the study. Section 5 discusses the empirical results. Finally, Section 6 concludes the study with a summary of findings and some policy recommendations.

2. Budget Deficit and Private Investment in Cote d'Ivoire

Like many African countries, Cote d'Ivoire's fiscal policy uses government spending to regulate the economy and provide social services. As Table 1 shows, total government expenditure increased from 15.8% of GDP in 2013 to 20% in 2020 and reached 22.13% in 2022. The increasing of government expenditure was ascribed to the implementation of the National Development Plans (PND) during the periods 2012-2015 and 2016-2020. The private investment rate increased from 6.3% of GDP in 2011 to 10.7% in 2013 and reached 15.7% in 2019 and 16.7% in 2022. At the same time, economic growth rate rose from -4.2% in 2011 to 6.2% in 2019 and averaged 8% over the period 2012-2019. The economic growth rate fall to 2% in 2020 due to the coronavirus pandemic, and then reached 7.4% in 2021 and 6.8% in 2022.

Table 1. Fiscal indicators and private investment, as percentage of GDP

Year	Budget deficit	Expenditure			Revenue			Private investment
		Total	Current	Other	Total	Tax	Nontax	
2013	-1.62	15.86	10.48	5.38	14.24	11.28	2.95	10.72
2014	-1.56	15.20	10.20	5.00	13.64	10.66	2.98	11.98
2015	-2.04	16.50	10.79	5.70	14.46	10.91	3.55	18.65
2016	-2.92	17.48	11.32	6.16	14.56	11.69	2.87	16.63
2017	-3.27	18.11	11.86	6.25	14.83	12.01	2.83	14.86
2018	-2.91	17.56	11.46	6.10	14.66	11.94	2.71	14.54
2019	-2.24	16.94	11.18	5.76	14.70	11.98	2.72	15.72
2020	-5.42	20.01	12.90	7.11	14.59	12.02	2.57	15.35
2021	-4.93	20.35	12.92	7.42	15.42	12.80	2.62	15.40
2022	-6.82	22.13	12.72	9.41	15.30	12.86	2.44	16.68

Source: MEF/MBPE.

Despite the impressive economic growth, the tax-to-GDP ratio grew slowly and lied below the target of 20% of the WAEMU Criteria. The tax-to-GDP ratio averages 13%, lagging behind Burkina Faso, Mali, and Senegal. The overall budget deficit has increased from 1.62% of GDP in 2013 to 2.24% in 2019 and reached 5.6% of GDP in 2020 due to corona virus related extra spending. The deficit fall at 4.93% of GDP in 2021 due to an improved collection of government revenues. However, the Russia-Ukraine war increases the deficit to 6.9% in 2022. The low tax ratio is mainly due to narrow tax base, inelastic and complex tax system, heavy reliance on commodity prices, large tax exemptions, and tax evasion. Cote d'Ivoire is losing about 1.2% of GDP from tax exemptions and 3% of GDP from tax evasion. The government's goal is to increase the tax-to-GDP ratio by 0.5 point per year so as to reach 3% of deficit by 2025.

3. Review of Literature

The impact of budget deficit on economic growth is a controversial issue in economics both at theoretical and empirical levels. Three economic theories explain the effects of budget deficit on private investment and economic growth. A review of these paradigms is provided by Bernheim (1989), Hemming et al. (2002), and

Saleh and Harvie (2005). The well-known Keynesian theory explains that there is a positive nexus between deficit and economic growth. Increasing deficit increases aggregate demand, and thus leads to higher private investment and economic growth (Eisner & Pierper, 1984; Eisner, 1989). This theory prescribes government spending to stimulate a sluggish economy in the short-run. This positive effect is commonly known as the “crowding-in effect” of budget deficit. Contrary to this, however, the neoclassical theory claims that deficit has detrimental effects on economic growth. It increases interest rate, which in turn discourages private investment and reduces economic growth (Bernheim, 1989). This negative effect is known as the “crowding-out effect” of budget deficit. The neoclassical theory further postulates that deficit leaves a huge tax burden on future generation if financed through borrowing. On the other hand, the Ricardian equivalence theory demonstrates that budget deficit is neutral to private investment and economic growth (Barro, 1989; Kormendi, 1983). Indeed, households make consumption decision according to the life cycle hypothesis and rational expectation behavior. Therefore, in case of budget deficit financed by borrowing, households will increase saving instead of consumption so as aggregate demand remains unchanged. This effect is known as the “Ricardian equivalence”.

Motivated by these controversial paradigms, a number of empirical studies have scrutinized the nexus between budget deficit and private investment. The empirical findings as regards this topic are however conflicting. Various empirical studies find a positive effect while others report a negative effect. For instance, Ghatak and Ghatak (1996) analyze the validity of the Ricardian equivalence theorem for India over the period 1950–1986. Applying cointegration techniques, they find significant crowding out effects on private consumption, but not on private investment. Bahmani-Oskooee (1999) examine the crowding-in versus crowding-out controversy in the case of the US over the 1947–1992 period. Using cointegration analysis, the results provide evidence supporting the crowding-in argument of the Keynesians. Anyanwu et al. (2018) examine the crowding-out effect of government domestic borrowing for a panel of 28 oil-dependent countries over the period 1990-2012. They find that a one percent increase in government borrowing from domestic banks shrinks private sector credit by 0.22 percent and has no significant effect on the lending interest rate. These findings suggest that the crowding-out effect of domestic borrowing works through the credit channel and not through the interest rate one. Many other studies reach similar results documenting the crowding-out effect hypothesis of public borrowing on bank credit to the private sector and private investment (Shetta & Kamaly, 2014; Kamundia et al., 2015; Mwakalila, 2020).

Fatima et al. (2011) study the impact of fiscal deficit on private investment and economic growth in Pakistan during 1980-2009. Using the two-stage least squares method, they find that deficit affects investment and real output adversely. Asogwa and Okeke (2013) examine the case of Nigeria using ordinary least squares and Granger causality test. The results disclose that budget deficit crowds out private investment. Furthermore, private investment causes budget deficit with feedback. Kibet (2013) examines the effect of deficit on private investment in a panel of 70 developing countries over the period 1984-2010. The study employs the Generalized Method of Moments (GMM) to control for endogeneity. Results demonstrate the crowding-out effect of deficit by reducing private investment. Biza et al. (2015) investigate the case of South Africa for the period 1994-2009 using cointegration as well as vector auto-regression (VAR) analysis. The results reveal budget deficits significantly crowding out private investment. Mwigeka (2016) tests whether budget deficit crowds out or crowds in private investment in Tanzania from 1970 to 2012. Using the Johansen cointegration test, the results validates the crowding-out effect. Omojolaibi et al. (2016) explore the nexus between fiscal policy and private investment in five West African countries (Ghana, Cote d’Ivoire, Nigeria, Senegal and Sierra Leone) from 1993 to 2014. Results from fixed effect regression show the existence of a significant crowding-in effect of government capital expenditure and tax revenue while non-tax revenue shows a crowding-out effect. Recurrent expenditure and external debt were also found to show crowding-out effects but these were found to be insignificant. Mose and Keino (2017) investigate the effect of budget deficit on private investment in East African Community over the period 1981-2015. They find that fiscal deficit had a negative effect on private investment in the region. Ahmed and Alamdar (2018) investigate the effect of budget deficit on private investment in Pakistan for the period 1984-2015. Using cointegration method, they find supporting evidence for crowding-out effect. Mohanty (2019) examines the impact of fiscal deficit on private corporate sector investment in India for the period 1970–2013. Using Autoregressive Distributed Lag (ARDL) approach, the study finds evidence supporting the crowding-out effect both in the long-run and in the short-run. The crowding-out effect is driven by domestic financing of fiscal deficit. External financing was found to have no significant effect on private corporate sector investment. Kalugalla et al. (2020) study the case of Sri Lanka for the period 1990-2015 and find a positive relationship between budget deficit and private investment. Akamobi and Unachukwu (2021) investigate the macroeconomic effects of budget deficit in Nigeria during the period from 1981 to 2019. The results obtained from the ARDL model suggest that budget deficit has a positive and significant impact on economic growth whereas it shows a negative and insignificant impact on private investment. Using data from

1981 to 2019, Shankar and Trivedi (2021) find that fiscal deficit has detrimental effect on private investment in India. The crowding-out effect of fiscal deficit is higher when public investment increases in mining and manufacturing but insignificant in infrastructure. Behera and Mallick (2022) explore the case of 14 Indian states from 1980 to 2020. The results from panel fixed effect regression reveal that fiscal deficit has negative impact on economic growth.

The empirical studies reviewed above are premised on the assumption that the nexus between budget deficit and private investment is linear. This means that whether deficit is increasing or decreasing, the reaction of private investment is the same in absolute value. This assumption might be misleading in light of evidence of nonlinear macroeconomic effects of fiscal policy. Recently, a limited number of empirical studies have addressed the issue of threshold effects of fiscal deficit on private investment and economic growth, and provided estimates of optimal budget deficit for different countries. Examining a panel of 45 developing countries, Adam and Bevan (2005) find a threshold of 1.5% of GDP beyond which fiscal deficit becomes detrimental to economic growth. Considering a panel data set of ten African countries from 1981 to 2010, Benayed et al. (2015) investigate the effect of public debt on domestic investment. The results from threshold regression show that public debt lower than 47.31% of GDP increases domestic investment. However, once the debt exceeds this threshold, it turns to be detrimental to domestic capital formation. In a study of 40 developing countries, Slimani (2016) demonstrates crowding-out effect for budget deficit exceeding 4.8% of GDP or fiscal surplus reaching 3.2% of GDP. Iqbal et al. (2017) find the threshold level of fiscal deficit for Pakistan at 5.57% of GDP. According to the study by Behera and Mallick (2022) for selected Indian states, the threshold level of deficit is 2.33% of GDP. Tran (2022) investigates the case of 48 Asian countries using panel threshold regression. The results of the study suggest that economic growth is best promoted with budget balance ranging from 22.69% to 25.19% GDP.

Regarding the African countries, some empirical evidence have been found. For Guinea, Onwioduokit (2012) finds a threshold level of 3% beyond which fiscal deficit lowers economic growth. Onwioduokit (2013) reports a threshold deficit of 7% for Sierra Leone. Onwioduokit and Basse (2014) identify the deficit threshold for the Gambia at 6% of GDP. The threshold level of budget deficit was estimated at 6% for Liberia by Onwioduokit and Inam (2018). In the case of Nigeria, Aero and Ogundipe (2018) report a threshold fiscal deficit level of 5% of GDP, whereas Umaru et al. (2021) find 2.02%. Kebalo and Zouri (2022) examining the case of the West African Economic and Monetary Union (WAEMU), find a threshold level of 3.97%. Recently, Keho (2023) found a threshold of 3% beyond which fiscal deficit impedes economic growth in Cote d'Ivoire. Overall, findings from African countries suggest a threshold level of budget deficit ranging between 1.5 and 7% of GDP. These findings demonstrate that large budget deficit would harm economic growth. However, as we can see from this review, there is no study examining the threshold effect of budget deficit on private investment in African countries.

4. Methodological Framework

4.1 Linear Model

The study investigates the effect of budget deficit on private investment in Cote d'Ivoire. To achieve this objective, we specify the empirical model as follows:

$$i_t = \theta_0 + \theta_1 bd_t + \theta_2 ge_t + \theta_3 gdp_t + \theta_4 inf_t + \mu_t \quad (1)$$

where i represents private investment as a ratio of GDP, bd is budget deficit as a percentage of GDP, ge is government expenditure as a share of GDP, gdp is the growth rate of real GDP, and inf is inflation rate. Budget deficit resulting from government expenditure can act as a substitute (negative effect) to or a complement (positive effect) for private investment. Therefore, the expected sign on budget deficit is ambiguous; it can either be positive or negative depending on the nature of government expenditure and the source of financing of the deficit, *i.e.*, domestic or external. Budget deficit is defined here as the difference between government expenditure and government revenue. It follows that the effect of a one unit increase in both government expenditure and revenue, keeping the budget deficit constant, is given by θ_2 . A one unit increase in budget deficit driven by a decline in government revenue (government expenditure being constant), is given by θ_1 . While a one unit increase in budget deficit driven by government expenditure (government revenue being constant) is given by $\theta_1 + \theta_2$.

To investigate the presence of a long-run relationship among the variables, the study employs the autoregressive distributed lag (ARDL) bounds test proposed by Pesaran et al. (2001). This approach is applicable to data set which is a mixture of I(0) and I(1) variables provided there are no I(2) variables and the dependent variable is I(1). Moreover, it allows the variables in the model to have different lags. Technically, the ARDL approach consists of estimating the following error correction model:

$$\Delta i_t = \phi_0 + \phi_1 i_{t-1} + \phi_2 bd_{t-1} + \phi_3 ge_{t-1} + \phi_4 gdp_{t-1} + \phi_5 inf_{t-1} + \sum_{i=1}^{p_1} \gamma_{1i} \Delta i_{t-i} + \sum_{i=0}^{p_2} \gamma_{2i} \Delta bd_{t-i} + \sum_{i=0}^{p_3} \gamma_{3i} \Delta ge_{t-i} + \sum_{i=0}^{p_4} \gamma_{4i} \Delta gdp_{t-i} + \sum_{i=0}^{p_5} \gamma_{5i} \Delta inf_{t-i} + e_t \tag{2}$$

where Δ is the difference operator defined as $\Delta Z_t = Z_t - Z_{t-1}$. The appropriate lag structure (p_1, p_2, p_3, p_4, p_5) was selected using the AIC criterion. The coefficients $\phi_1 - \phi_5$ represents the long-run relationship of the model whereas the parameters $\gamma_{1i} - \gamma_{5i}$ represent the short-run dynamics. The null hypothesis of no long-run relationship is $H_0: \phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = 0$. This hypothesis is tested through an F -test. Under the null hypothesis, however, the distribution of the F -statistic is non-standard. Pesaran et al. (2001) have provided critical values that account for integrating properties of the variables. To ascertain the goodness of fit of the ARDL model, we conduct diagnostic and stability tests. The diagnostic tests examine the serial correlation, normality, and heteroskedasticity associated with the model. The structural stability of the model is scrutinized using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ).

4.2 Threshold Regression Model

Eq.(1) assumes that the effect of budget deficit on private investment is the same regardless of the level of deficit. This model would be misleading if the relationship between deficit and private investment is not consistent with a linear pattern. To investigate the existence of threshold effect, we modify Eq.(1) to allow differences in the response of private investment to changes in the budget deficit. To this end, we make use of the threshold regression model introduced by Tong and Lim (1980) and extended by Hansen (1996). The threshold investment equation is then specified as follows:

$$i_t = \alpha + \gamma_1 bd_t \times I_t (bd_t \leq k^*) + \gamma_2 bd_t \times I_t (bd_t > k^*) + \gamma_3 X_t + \mu_t \tag{3}$$

where $X_t = (ge_t, gdp_t, inf_t)$ and I_t is a dummy variable taking a value of 1 if $bd_t > k^*$ and 0 otherwise, k^* is the threshold level of budget deficit that splits the sample into two regimes. The main feature of Eq.(3) is that it allows the effect of budget deficit on private investment to change with the size of the deficit. The effect of the budget deficit is given by γ_1 when deficit is less than or equal to the threshold level k^* and by γ_2 when deficit exceeds the threshold one. Evidence of threshold effect would be associated with a significant difference between γ_1 and γ_2 .

When estimating a threshold model, two issues need to be addressed. The first issue is related to the determination of the threshold value k^* . The second issue examines the existence of the threshold. Following Chan (1993) and Hansen (1996), we estimate the optimal threshold by selecting the value that minimizes the residual sum of squares of the model. Next, we test for the existence of a significant threshold relationship between deficit and private investment ($H_0: \gamma_1 = \gamma_2$) by mean of the F -statistic defined as follows:

$$F_1^* = n \frac{S_0 - S_1(k^*)}{S_1(k^*)} \tag{4}$$

where S_0 and S_1 are the residual sum of squares for models without and with threshold effects, respectively, and n is the number of observations.

As the threshold k^* is not identified under the null hypothesis, the asymptotic distribution of F_1^* is non-standard and conventional inference cannot be applied. Hansen (2000) has derived a bootstrap-based method to calculate the p -value of the test statistic. Using this method, the values of the regressors are fixed, and a new dependent variable \tilde{u}_t is generated from $N(0,1)$. For each bootstrap iteration, we set $\tilde{y}_t = \tilde{u}_t$ and regress \tilde{y}_t on all regressors under null and alternative hypotheses to obtain the restricted and unrestricted residual sum of squares S_0 and $S_1(k)$. From these statistics we computed:

$$\tilde{F}_1(k) = n \left(\frac{\tilde{S}_n - \tilde{S}_1(k)}{\tilde{S}_1(k)} \right) \tag{5}$$

$$\tilde{F}_1^* = \underset{\gamma \in \Gamma}{Sup} \tilde{F}_1(k) \tag{6}$$

The distribution of \tilde{F}_1^* provides the bootstrap distribution of F_1^* and the bootstrap p -value is the frequency of simulated \tilde{F}_1^* exceeding F_1^* .

4.3 Data Description

The study uses time series data covering the period 1975-2022 to investigate the effect of budget deficit on private investment in Cote d'Ivoire. The dependent variable of the study is private investment measured as the ratio of private gross fixed capital formation to GDP. The independent variable of interest is the overall budget deficit (including grants) as a share of GDP. Positive (negative) value of the budget deficit variable means deficit (surplus). Based on the literature review, we include as control variables, the annual growth rate of real GDP, the ratio of government expenditure to GDP, and inflation rate computed as the change rate of the GDP deflator. Our goal in this study is not to find out the determinants of private investment, but to check the sign of the relationship between deficit and private investment. Table 2 gives the description and sources of the variables.

Table 2. Description of the variables

Variable	Measurement	Source
INV	Private gross fixed capital formation as a ratio of GDP	WDI/MEF
GDP	Growth rate of real GDP	BCEAO/MEF
BD	Budget balance (in including grants) as a share of GDP	BCEAO/MBPE/MEF
GE	Total government expenditure as a share of GDP	BCEAO/MBPE
INF	Change rate of the GDP deflator	WDI

Note. BCEAO—Banque Centrale des Etats de l'Afrique de l'Ouest (Central Bank of West African States). MEF—Ministry of Economics and Finance. WDI—World Development Indicators of the World Bank, available at <http://datacatalog.worldbank.org/> on 16 may 2023. MBPE—Ministry of Budget and State Portfolio.

Table 3 reports descriptive statistics of the variables. Over the sample period, private investment averages 9.989% of GDP and ranges between 4.140% and 18.657%, respectively observed in 1993 and 2015. The budget deficit averages 4.727% of GDP and fluctuates between -2.870% in 1985 and 16.655% in 1989. Government expenditure as a share of GDP shows an average of 26.032%. The mean of real GDP growth rate is 3.166% with a minimum of -10.957% and a maximum of 12.916%, which were respectively observed in 1976 and 1980. Inflation rate averages 6.041% and reaches its maximum at 56.283% and its minimum at -4.523%, coming respectively from 1996 and 1990. It is evident from the Jarque-Bera statistic that private investment (INV) and economic growth rate (GDP) are normally distributed while budget deficit (BD), government expenditure (GE) and inflation rate (INF) depart significantly from the normal distribution.

Table 3. Descriptive statistics of variables

Variables	INV	BD	GE	GDP	INF
Mean	9.989	4.727	26.032	3.166	6.041
Median	8.770	2.671	17.834	2.468	2.926
Maximum	18.657	16.655	80.402	12.916	56.283
Minimum	4.140	-2.870	11.523	-10.957	-4.523
Std. Dev.	3.897	5.235	15.928	4.589	11.630
Jarque-Bera	4.029	7.367	24.451	1.227	200.674
Prob.	0.133	0.025	0.000	0.541	0.000
<i>n</i>	48	48	48	48	48

Note. INV=Private gross fixed capital formation as a ratio of GDP; BD=Budget deficit as a ratio of GDP; GE=Government expenditure as a share of GDP; GDP=Growth rate of real GDP; INF= Growth rate of the GDP deflator.

The correlation matrix between the variables is displayed in Table 4. This table shows that government expenditure (GE) and economic growth rate (GDP) are positively related to the private investment rate (INV). Conversely, budget deficit (BD) and inflation (INF) have a positive but insignificant connection with private investment. The Table also reveals a positive correlation between deficit and government expenditure and a negative association between deficit and economic growth. Furthermore, there is no evidence of strong relationship among the explanatory variables as all correlation coefficients are lower than 0.80. To further check the multicollinearity among the explanatory variables, we perform the variance inflation factor (VIF) analysis. The VIF and tolerance statistics reveal that the explanatory variables are free from severe multicollinearity problem.

Table 4. Correlation matrix and colinearity test results

Variables	Correlation coefficients					Colinearity results	
	INV	BD	GE	GDP	INF	VIF	Tolerance
INV	1.000	0.093	0.337*	0.497*	0.071	-	-
BD		1.000	0.613*	-0.239**	0.050	1.924	0.519
GE			1.000	0.055	0.186	1.879	0.531
GDP				1.000	0.002	1.149	0.869
INF					1.000	1.094	0.913

Note. INV=Private gross fixed capital formation as a ratio of GDP; BD=Budget deficit as a ratio of GDP; GE=Government expenditure as a share of GDP; GDP=Growth rate of real GDP; INF= Growth rate of the GDP deflator. The general rule is $VIF < 5$ and $Tol > 0.2$. The asterisks * and ** indicate significance at the 5% and 10% levels, respectively.

As a first step in exploring the bivariate relationship between budget deficit and private investment, Figure 1 depicts the trends of both variables over the past five decades. As can be seen, Cote d'Ivoire has been facing persistent budget deficits over time. Over the period 1975-2022, the country recorded 44 years of deficit and only four years of surplus. This shows that government expenditure structurally exceeds government revenue. Furthermore, although the correlation between deficit and private investment rate is weak (0.093), we observe different patterns over certain periods of time. For instance, private investment shows a decreasing trend from 1975 to 1993, then stagnated between 1994 and 2011, and started increasing during 2012-2022. Private investment rate averaged 9.64%, 7.69% and 14.35% over the sub-periods 1975-1993, 1994-2011 and 2012-2022, respectively, while the deficit averaged 8.83%, 1.28% and 3.27% over the same sub-periods. The correlation coefficient between deficit and private investment was 0.057, -0.112, and 0.394 over the three sub-periods, respectively.

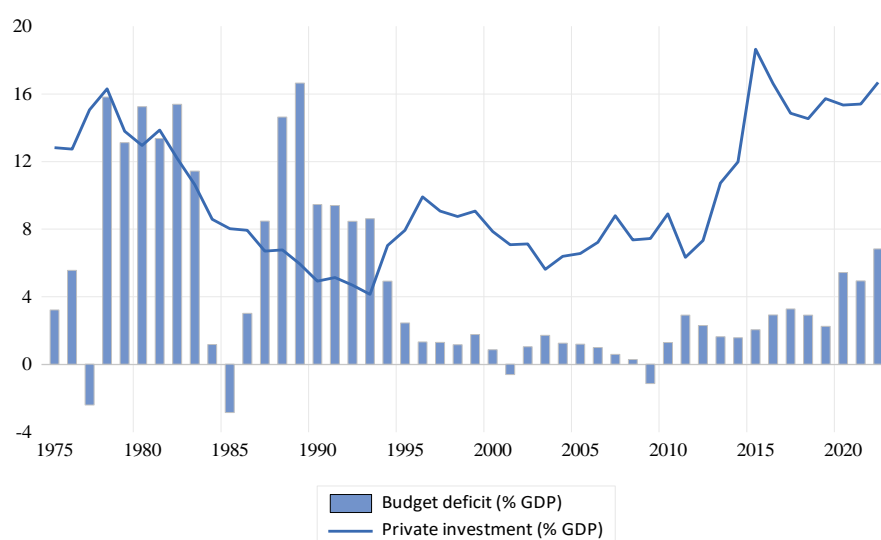


Figure 1. Budget deficit and private investment (% GDP)

Note. Budget deficit is defined as government expenditure minus revenue. Positive and negative values mean deficit and surplus, respectively.

5. Results and Discussion

Prior to the estimation of the threshold model, we examine the stationary status of the variables. For this purpose, we apply the PP test of Phillips and Perron (1988) and the DF-GLS test developed by Elliott et al. (1996). The results displayed in Table 5 suggest that deficit, economic growth rate and inflation rate are stationary whereas private investment and government expenditure have unit root at the level but are stationary at the first difference. This outcome confirms that the dependent variable is non-stationary whereas the explanatory variables are a combination of stationary and non-stationary series, giving a valid rationale for using the ARDL bounds testing approach to cointegration.

Table 5. Results of unit root tests

Series	Level		First difference		Decision
	PP	DF-GLS	PP	DF-GLS	
INV	-1.245	-1.118	-6.286*	-6.360*	I(1)
BD	-2.919**	-2.567*	-9.520*	-7.116*	I(0)
GE	-1.269	-1.854	-5.802*	-1.063	I(1)
GDP	-3.988*	-3.425*	-9.299*	-7.461*	I(0)
INF	-5.614*	-2.972*	-14.348*	-2.418*	I(0)

Note. INV=Private gross fixed capital formation as a ratio of GDP; BD=Budget deficit as a ratio of GDP; GE=Government expenditure as a share of GDP; GDP=Growth rate of real GDP; INF=Growth rate of the GDP deflator. The tests were carried out with the presence of intercept in unit root estimating equation. The asterisks * and ** denote the rejection of the null hypothesis at the 5% and 10% levels, respectively.

The next step of our empirical analysis is to test for the existence of a long-run relationship between the variables. Results from the bounds test are depicted in Table 6. The estimated value of the F-statistic ($F = 7.519$) is greater than the upper bounds critical value (4.47) at 5% level of significance, confirming the existence of a long-run relationship between the variables. The diagnostic tests show that the error term of the estimated model is normally distributed, and free from correlation and heteroskedasticity.

Table 6. Bounds test for cointegration

Model	F-statistic	5% critical values		10% critical values	
		$n=45$		$n=45$	
		I(0)	I(1)	I(0)	I(1)
INV=f(BD, GE, GDP, INF)	7.519*	3.47	4.47	2.95	3.86
Residual Diagnostic tests					
Jarque-Bera normality test		0.123 (0.940)			
Breusch-Godfrey correlation test		2.139 (0.143)			
White Heteroskedasticity test		25.091 (0.157)			

Note: INV=Gross fixed capital formation as a ratio of GDP; BD=Budget deficit as a ratio of GDP; GE=Government expenditure as a share of GDP; GDP=Growth rate of real GDP; INF=Growth rate of the GDP deflator. The selected model was based on AIC with a maximum lag set to 5. The model includes constant, trend and a dummy variable DUM94-14 as deterministic regressors. The asterisk * denotes the rejection of the null hypothesis at the 5% level.

To crosscheck our results, we also deploy Johansen (1988) cointegration test. The results are portrayed in Table 7. Both the trace and maximum eigenvalue statistics confirm the presence of long-run relationships between private investment, budget deficit and other control variables.

Table 7. Johansen cointegration test results

# of CE	Trace test		Max-Eigen test	
	Statistic	Prob.	Statistic	Prob.
0	186.242*	0.000	93.806*	0.000
1	92.436*	0.000	34.596*	0.024
2	57.839*	0.000	32.060*	0.006
3	25.779**	0.051	19.723*	0.044
4	006.056	0.453	006.056	0.453

Note. * denotes rejection of the hypothesis at the 5% level.

Next, we proceed to estimate the long-run coefficients associated with each explanatory variable. We apply the ARDL approach along with the VAR approach designed by Johansen (1988) and the Dynamic OLS (DOLS) estimator developed by Stock and Watson (1993). The results are portrayed in Table 8. As expected, the importance of economic growth is emphasized by its positive and significant effect associated with private investment. A one percentage point increase in economic growth rate is associated with a 0.615 percentage point rise in private investment rate. This result is in line with the accelerator theory of investment. The effect of government expenditure was found to be negative and insignificant, suggesting that fiscal policy that increases

both government expenditure and government revenue keeping the deficit constant does not influence private investment rate in Cote d'Ivoire. However, a fiscal policy resulting in budget deficit ascribed to government expenditure, reduces private investment rate. The negative effect is such that a one percentage point increase in the budget deficit, driven by government spending, is associated with decrease in private investment rate by 0.494 percentage point. Accordingly, fiscal policy crowds out private investment in Cote d'Ivoire. This might be due to fact that budget deficit reduces the domestic credits to the private sector by banks.

Table 8. Long-run coefficients of linear model

Variables	ARDL	DOLS	Johansen
BD	-0.492* [-2.958]	-0.389* [-2.053]	-0.435* [-3.612]
GE	-0.002 [-0.017]	0.304* [6.166]	-0.039 [-0.613]
GDP	0.615* [5.467]	0.667* [4.535]	0.329* [2.287]
INF	0.084* [3.000]	0.011 [0.221]	0.097* [2.756]
Trend	0.149* [2.547]	0.118* [2.018]	0.175* [4.311]
Test $H_0: \theta_1 + \theta_2 = 0$			
<i>t</i> -stat.	-0.494*	-0.085	-0.473*
Prob.	0.007	0.664	0.007

Note. The dependent variable is gross fixed capital formation as a ratio of GDP (INV); BD=Budget deficit as a ratio of GDP; GE=Government expenditure as a share of GDP; GDP=Growth rate of real GDP; INF=Growth rate of GDP deflator. The model estimated includes a dummy variable DUM90-14 taking value 1 between 1990 and 2014 and 0 otherwise. The asterisk * and ** denote statistical significance at the 5% and 10% level, respectively.

The above findings may be misleading if the nexus between budget deficit and private investment is nonlinear and asymmetric. We further proceed with the threshold regression results. As reported in Table 9, the F-statistic strongly supports the existence of threshold effect of budget deficit on private investment. The threshold level of deficit is identified at 2.287% of GDP. The estimates from the threshold model reveal several interesting facts. First, the role of economic growth is reemphasized by its positive and significant relationship with private investment. Second, an increase in government expenditure as share of GDP has a positive and significant effect on private investment. A one percentage point increase in both government spending and government revenue (keeping deficit constant) results in about a 0.127 percentage point increase in private investment rate. This finding underscores the role of government expenditure in enhancing private investment in Cote d'Ivoire.

Table 9. Threshold effects of budget deficit on private investment

Variable	Coef.	t-stat.	Prob.
BD _{inf}	0.517*	2.592	0.013
BD _{sup}	-0.075	-1.460	0.152
GE	0.127*	3.733	0.000
GDP	0.123*	2.654	0.011
INF	0.041*	2.522	0.016
Trend	0.137*	3.940	0.000
INV(-1)	0.616*	7.475	0.000
C	-2.893*	-2.858	0.006
R ²		0.927	
<i>n</i>		47	
Threshold testing			
Threshold		2.287%	
F value ($H_0: \gamma_1 = \gamma_2$)		7.856*	
<i>p</i> -value		0.008	

Note. The dependent variable is gross fixed capital formation as a ratio of GDP (INV); BD_{inf} (BD_{sup}) indicates budget deficit below (above) the threshold deficit; GE=Government expenditure as a share of GDP; GDP=Growth rate of real GDP; INF= Growth rate of the GDP deflator. The model includes a dummy variable DUM2003_2014 taking value 1 between 2003 and 2014 and 0 otherwise. * indicates significance at the 5% level.

Third, the most important result is the effect of budget deficit on private investment. The results divulge that when deficit is below 2.287% of GDP, private investment rate increases with expanding budget deficit. The

positive association is such that a one percentage point increase in the budget deficit, driven by government spending, brings about a 0.645 percentage point increase in private investment. Conversely, when deficit exceeds 2.287% of GDP, it has no significant effect on private investment. Beyond 2.287% of GDP, a one percentage point increase in the deficit leads to about 0.052 percentage point increase in private investment but this effect is insignificant. These findings imply that increasing deficit beyond 2.287% of GDP is neutral to private investment. We conclude that the crowding-out hypothesis does not hold in the case of Cote d'Ivoire. Instead, deficit crowds in private investment provided that it does not exceed 2.3% of GDP.

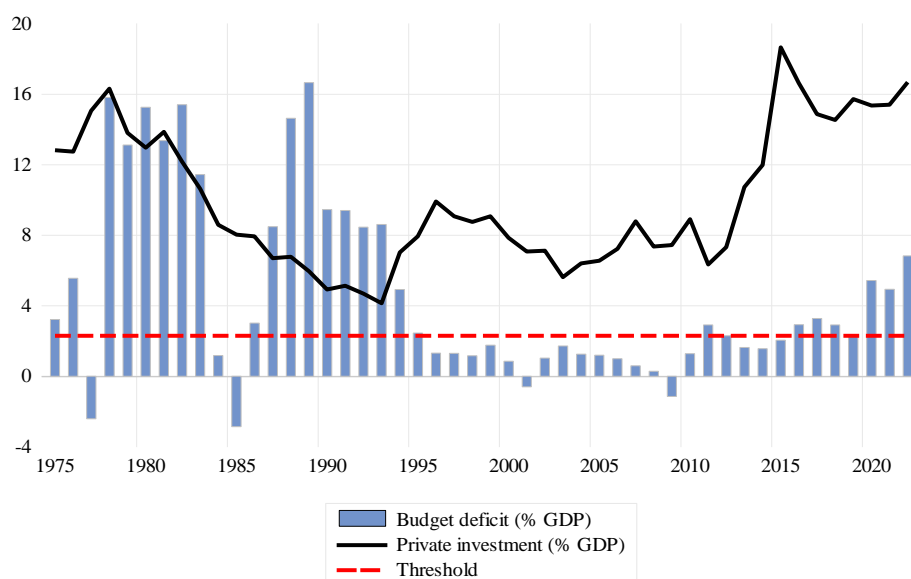


Figure 2. Cote d'Ivoire's budget deficit vs. the threshold level

Figure 2 depicts the trends of budget deficit, private investment and the threshold over the sample period. From this figure, there were 22 years where deficit was lower than the 2.287% threshold level with an average of 0.737%, and 26 years where deficit was higher than the threshold with an average of 8.104%. The average private investment for the periods where deficit was below the threshold is 9.358% of GDP while that for periods that breached the threshold level is 10.523% of GDP. The test of equality reported in Table 10 suggests that the difference between both means is not significant, confirming the finding that beyond the threshold level of 2.287% of GDP, the budget deficit does not influence significantly the private investment rate.

Table 10. Budget deficit and private investment across regimes

	Deficit $\leq 2.287\%$		Deficit $> 2.287\%$	
	Deficit	Private investment	Deficit	Private investment
Mean	0.737	9.358	8.104	10.523
Std. Dev.	1.343	3.290	4.913	4.337
c.v.	1.822	0.352	0.606	0.412
<i>n</i>	22	22	26	26
Tests of equality of means (Prob.)	-6.811 (0.000)	-1.032 (0.307)		

Note. c.v. stands for the coefficient of variation defined as the ratio of the standard deviation to the mean.

6. Conclusion

This study was designed to investigate whether budget deficit crowds out private investment in Cote d'Ivoire. Previous studies that examine this topic mostly assume a linear relationship between budget deficit and private investment. The results from these study may be misleading if private investment responds asymmetrically to budget deficit. The study uses time series data spanning from 1975 to 2022 and deploys threshold regression technique. We estimate an investment function including budget deficit, government expenditure, real GDP growth rate, and inflation rate as explanatory variables. The study reaches several important findings. First, economic growth was found to be positively associated with private investment. This finding is consistent with

the accelerator theory of investment and accords with many existing works. It suggests that economic growth is a major driver of private investment in Cote d'Ivoire. Second, government expenditure leaves positive effect over private investment as advocated by the Keynesian view. However, it is worth noting that this positive effect occurs under constant budget deficit. Third, the core finding of the study provides evidence supporting the crowding-in effect of budget deficit on private investment provided that it is lower than 2.3% of GDP. When deficit exceeds this limit, it has no significant effect on private investment. Overall, the findings of this research provide evidence that government can use deficit to stimulate private investment in Cote d'Ivoire. Since 2020, Cote d'Ivoire records deficit greater than the threshold of 2.3% and envisions to curb it to 3% by 2025. Reducing the deficit would require strong measures to improve tax revenue and restrain the growth of public expenditure. It is possible to increase tax revenue by reducing revenue losses from exemptions and evasion, which amount about 4.2% of GDP.

This study suffers from certain limitations. First of all, the study has not examined how the financing of budget deficit affects private investment. There is evidence that domestic borrowing is more likely to crowd-out private investment than external borrowing. Further research could be conducted to evaluate whether domestic deficit financing in Cote d'Ivoire crowds out private investment. Another potential caveat of this study is that the findings may be plagued with the omission of some important control variables. One such variable may be the quality of institutions. It has been shown in the empirical literature that low institutions undermines the effectiveness of economic and fiscal policies in developing countries. Therefore, further study could build on the current study by investigating the role of institutional quality in shaping the relationship between budget deficit and private investment. We intend to examine these issues in future research.

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