



The Crowding-Out Effect Of Public Debt On Private Investment In Morocco

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Abstract: This study delves into the effects of public debt and public debt service on private investment in Morocco, with a special focus on the crowding-out phenomenon in both the short and long term. Morocco, like many emerging economies, has faced increasing public debt over the past decade as the government has sought to finance critical infrastructure projects, social programs, and respond to economic shocks, such as the COVID-19 pandemic. Public debt in Morocco has risen as a tool to fuel development and stimulate economic activity, yet the long-term effects of this debt on the private sector remain a key concern for policymakers.

Using an AutoRegressive Distributed Lag (ARDL) model, the analysis examines the relationship between public debt, public debt service, inflation, and the savings rate on private sector investment in the Moroccan context. Morocco, like many developing countries, has seen its public debt increase in recent years due to efforts to finance key infrastructure projects and manage economic challenges. The findings reveal a positive long-term relationship between public debt and private investment, indicating that public borrowing, when managed effectively, can stimulate private sector growth. However, the study also identifies a significant negative impact of public debt service on private investment, highlighting the crowding-out effect, where rising debt repayment costs limit credit availability for the private sector. Inflation and the savings rate are found to positively influence private investment, further emphasizing the importance of macroeconomic stability. Stability tests confirm the robustness of the model, indicating reliable results over time. The study concludes that while public debt can contribute to Morocco's economic growth, the burden of debt service presents risks to private sector development, underscoring the need for prudent debt management to avoid long-term crowding-out effects.

INTRODUCTION

The crowding-out effect of public debt on private investment is a major issue, particularly for developing countries like Morocco, where achieving stable and sustainable economic growth is a national priority. Private investment plays a fundamental role in driving economic activity by stimulating job creation, enhancing business competitiveness, and improving overall productivity. It is also a key factor in fostering innovation and industrialization, which are essential engines for economic transformation.

However, excessive public debt or an overly burdensome debt service can have a discouraging effect on private investment. When the government borrows heavily to finance its expenditures, it can absorb a significant portion of the available financial resources in the market, leaving less capital for private enterprises. This phenomenon, known as the crowding-out effect, is amplified when interest rates rise due to increased competition for these limited resources. Private companies, particularly small and medium-sized enterprises (SMEs), which form the backbone of the Moroccan economy, may face greater difficulties in accessing credit, thus hindering their expansion and future investments.

In Morocco's case, the continuous increase in public debt over recent years, largely driven by efforts to fund infrastructure projects, social reforms, and respond to economic shocks such as the COVID-19 crisis, has

raised growing concerns. While these public investments are crucial for the country's development, they risk reducing the private sector's ability to invest if available financial resources in the system become scarce. This situation could have negative long-term repercussions on economic growth, as the private sector plays a central role in diversifying the economy and improving its resilience to external shocks.

Neoclassical economic theory suggests that the accumulation of public debt, when it becomes excessive, puts pressure on the available financial resources in an economy. This situation can lead to an increase in interest rates, as the government directly competes with the private sector for access to funds in financial markets. When the state borrows heavily, lenders may demand higher returns to compensate for the increased risk associated with high public debt or simply due to the increased demand for financing. This rise in interest rates translates into a higher cost of credit for private companies, reducing their ability to access the necessary financing for their investment projects.

The limitation of credit access for private companies has several consequences. Firstly, it hampers their ability to invest in new equipment, infrastructure, technologies, or expansions, which limits their short-term growth. Secondly, it stifles innovation, a crucial driver for improving the competitiveness of businesses and the economy as a whole. Without sufficient investments, companies cannot develop new products, processes, or services, reducing their ability to adapt to market changes or increase productivity. In the long run, this dynamic can restrict an economy's growth potential, as a less dynamic and innovative private sector contributes less to job creation, income growth, and overall economic well-being.

In this context, this study aims to conduct an in-depth analysis of the crowding-out effect of public debt on private investment in Morocco. The AutoRegressive Distributed Lag (ARDL) model is particularly well-suited for this purpose. This econometric model allows for the examination of dynamic relationships between public debt and private investment both in the short and long term. Unlike other models, ARDL has the advantage of being able to handle time series that may be stationary or non-stationary, offering great flexibility in analyzing real economic data. By using this analytical framework, the study will identify the immediate effects of public debt on private investment, as well as explore cumulative long-term impacts.

The results of this study will provide valuable insights for Moroccan policymakers. They will help guide decisions regarding public debt management and the development of strategies aimed at stimulating private investment, which is a key driver of sustainable economic growth. The goal is to strike a balance between the need to finance public expenditures, especially for priority sectors like infrastructure and education, and the necessity to maintain an economic environment in which private companies can thrive, innovate, and actively contribute to the country's economic growth.

In summary, this analysis seeks to offer a nuanced and rigorous understanding of the crowding-out effect in the Moroccan context, taking into account the country's economic specificities and the challenges it faces in terms of growth and development.

2. Literature Review

The theoretical and empirical perspectives on the crowding-out effect of public debt on private investment are diverse and often conflicting, making it difficult to reach a clear and unanimous understanding of the issue. Some theories strongly assert that the accumulation of public debt exerts significant pressure on available financial resources, thereby reducing private investment, particularly by raising interest rates. Others, however, argue that under certain conditions, such as during a recession, public debt can stimulate the economy without necessarily hindering private investment, and may even support it through spillover effects from public spending.

Empirically, the results also vary depending on the economic contexts, the periods studied, and the methodologies used. In some cases, studies show a pronounced crowding-out effect, while in others, this effect appears to be marginal or even nonexistent. These discrepancies are due to the complex interactions between public debt, monetary policies, and the specific economic conditions of each country or region.

Thus, the lack of consensus among researchers highlights the need to clarify this issue. It is essential to reexamine the theoretical foundations while enriching the empirical analysis to better understand the underlying mechanisms. This clarification will not only help identify the conditions under which the crowding-out effect occurs, but also provide more tailored policy recommendations aimed at balancing public debt management with the promotion of private investment.

2.1 Theoretical Literature Review

The crowding-out effect of public debt on private investment has been a central point of debate in economic theory, with various schools of thought providing differing interpretations of how public borrowing influences private sector activity. These theories offer contrasting views on the extent and nature of this effect, reflecting the complexity of the relationship between public debt and private investment.

From a neoclassical perspective, public debt is typically seen as detrimental to private investment. The theory posits that when the government borrows to finance its expenditures, it competes with private firms for the same pool of financial resources. This increased demand for funds raises interest rates, making it more expensive for private companies to borrow and invest. The neoclassical model assumes that the supply of capital is limited and that government borrowing directly reduces the funds available for private sector investments. This view is particularly concerned with long-term economic growth, as it suggests that high levels of public debt reduce capital formation and thus slow down the economy's capacity for growth. In this model, the crowding-out effect is most pronounced when public debt levels are high relative to the available financial resources.

On the other hand, Keynesian economics challenges this traditional view, particularly in times of economic downturns or recessions. Keynesians argue that when an economy is underperforming, with high unemployment and low aggregate demand, public borrowing can stimulate economic activity without significantly affecting private investment. In such cases, increased government spending, financed through debt, can lead to higher demand for goods and services, thereby encouraging private companies to invest in response to this demand. This "crowding-in" effect is based on the idea that public expenditure can create an environment in which private investment is more attractive, especially when businesses are hesitant to invest due to economic uncertainty. Keynesians believe that during periods of slack in the economy, the risk of crowding out is low, and public borrowing may actually be necessary to reignite private sector confidence and investment.

Ricardian equivalence, another important theoretical perspective, further complicates the discussion by suggesting that public borrowing might have no significant effect on private investment at all. This hypothesis, developed by economist David Ricardo and later formalized by Robert Barro, posits that individuals are forward-looking and rational. According to this view, when the government borrows, people anticipate future tax increases to repay the debt. As a result, they increase their savings to prepare for these future taxes, leaving the total level of investment in the economy unchanged. In this scenario, neither crowding-out nor crowding-in occurs, as the increased savings by the private sector perfectly offset the additional public borrowing. However, the assumptions of Ricardian equivalence—such as fully rational behavior and perfect foresight—are often criticized for being unrealistic in real-world settings, particularly in developing economies.

In more recent years, "endogenous growth theory" has added further nuance to the debate. This theoretical framework suggests that the effect of public debt on private investment may depend on the type and quality of government spending. If public debt is used to finance productive investments such as infrastructure, education, or research and development, it could enhance the long-term growth potential of the economy and even encourage private sector investment. For instance, improved infrastructure can reduce costs for private businesses, and investments in education and technology can raise productivity, both of which create a more favorable environment for private investment. In contrast, if public borrowing is primarily used for consumption or inefficient projects, it may fail to generate these positive spillover effects and could instead have a negative impact on the private sector by diverting resources away from more productive uses.

In summary, the theoretical literature presents a range of interpretations of how public debt affects private investment. While the "neoclassical view" stresses the risks of higher interest rates and reduced private investment, the "Keynesian approach" highlights the potential for public debt to stimulate economic activity in certain conditions. The "Ricardian equivalence" theory questions whether public borrowing impacts investment at all, while "endogenous growth theory" adds the crucial consideration of how the quality of public spending influences long-term private investment. Each of these perspectives provides valuable insights into understanding the dynamics of public debt and investment, particularly in economies like Morocco, where balancing public spending and promoting private sector growth are key challenges for policymakers.

2.2 Empirical Literature Review

Empirical research on the crowding-out effect of public debt on private investment has produced mixed results, largely due to variations in economic contexts, methodological approaches, and data availability. This diversity of findings reflects the complexity of the relationship between public debt and private investment, with the magnitude and direction of the crowding-out effect often differing from one country to another and across different time periods.

Many studies that examine advanced economies, such as those in OECD countries, tend to support the traditional neoclassical view, which argues that high levels of public debt lead to higher interest rates, thereby reducing private investment. For instance, studies by Gale and Orszag (2003) and Elmendorf and Mankiw (1999) find evidence that increasing public debt, particularly in the form of large fiscal deficits, raises long-term interest rates, which in turn crowds out private sector investment. These studies suggest that in economies with developed financial markets, the link between public borrowing and rising interest rates is strong, leading to a significant crowding-out effect. They also highlight that the effect tends to be more pronounced when government debt reaches high levels relative to GDP, as investors demand higher returns to compensate for the perceived risk of default or inflationary pressures.

In contrast, the empirical evidence from developing countries often paints a more nuanced picture. Several studies find that the crowding-out effect is not as clear-cut in these economies, with the relationship between public debt and private investment being influenced by a variety of factors, including the nature of the financial system, the level of economic development, and the purpose of public borrowing.

For example, in low-income countries, where capital markets are less developed, studies have found that public debt does not always crowd out private investment. Pattillo, Poirson, and Ricci (2004), in their cross-country analysis of developing nations, found that while excessive public debt levels can have a negative impact on private investment, the relationship is nonlinear. At moderate levels of debt, public borrowing may not significantly deter private investment, and in some cases, it can even complement private sector activity, particularly if the borrowed funds are used to finance productivity-enhancing public investments, such as infrastructure or education. Similarly, a study by Mbate (2013) on Sub-Saharan African countries found that public debt does not necessarily crowd out private investment in the short run, especially when government spending is targeted toward sectors that boost economic growth.

In the context of emerging economies, the empirical findings are often mixed. Studies like that of Kumar and Woo (2010), which explored the impact of public debt on growth in both advanced and emerging markets, found that in emerging economies, the crowding-out effect is more pronounced when public debt exceeds certain thresholds, often around 90% of GDP. Beyond this level, public debt tends to exert a negative impact on private sector investment by raising interest rates and reducing the availability of credit to the private sector. However, these effects are highly context-dependent, with factors such as institutional quality, inflation control, and external economic conditions playing key roles in determining the extent of the crowding-out effect.

Specific studies on the Moroccan economy also provide valuable insights into the dynamics of public debt and private investment. Research by Bouoiyour and Yazidi (2014), for instance, found that while Morocco's public debt has increased significantly in recent years, the crowding-out effect on private investment has been moderate. The study suggests that Morocco's relatively stable financial system and prudent debt management policies have mitigated the adverse effects of public borrowing on private sector credit availability. However, the study also notes that as public debt continues to rise, particularly due to large-scale infrastructure projects and social spending, there is a growing risk that the crowding-out effect could become more pronounced, especially if global financial conditions tighten or if Morocco's fiscal position weakens.

A more recent study conducted by Kabir and Flath (2020) examined a panel of 73 countries, encompassing both developed and developing economies, over the period from 1995 to 2014. They found that an increase in public debt held by banks proportionally reduces the amount of bank credit available to the private sector. Specifically, for every additional dollar of public debt, there is a corresponding one-dollar reduction in credit available for the private sector.

Kurul (2020) explored the crowding-out effect of outward foreign direct investment (FDI) on domestic investment in Turkey, covering the period from 1970 to 2018 using the ARDL method. The results show that outward FDI has a crowding-out effect on domestic investment, thus reducing its level.

Similarly, Pinardon-Touati (2021) focused on France and analyzed data from 2006 to 2018, revealing the existence of a similar crowding-out effect. The study shows that an increase in local government debt, financed by domestic banks, leads to a reduction of €0.50 in private credit for every additional euro of public debt. Furthermore, this crowding-out effect negatively impacts economic output, which decreases by €0.30 for every additional euro of public debt. These findings highlight the potential consequences of public debt accumulation on banks' ability to finance the private sector and, by extension, on economic growth.

Diallo Sira Samballa (2021) studied the impact of public debt on investment in Mali over the period from 1970 to 2017, based on the model by Konso Bola (2005). Using econometric analysis of time series data, the results indicate that public debt has a positive and significant effect on investment in Mali, showing that public debt stimulates investment in the country.

Finally, Şeref Can Serin and Murat Demir (2023) analyzed the crowding-out effect of public debt and public investment on private investment in Turkey from 1975 to 2020 using the ARDL method. The results indicate

that public investment, the stock of domestic public debt, and the servicing of external debt have a crowding-out effect on private investment. However, the stock of external public debt exerts a positive "crowding-in" effect on private investment.

3. Methodology and Study Data

3.1 Methodology: ARDL Modeling

The methodology adopted in this study is based on an econometric approach using the ARDL (AutoRegressive Distributed Lag) model, a widely used method for analyzing dynamic relationships between economic variables, particularly when they are non-stationary and have different levels of integration. This method is particularly suitable for analyzing time series data, allowing for the examination of both short- and long-term effects of explanatory variables on the dependent variable.

The ARDL model is chosen for several reasons. First, it offers great flexibility as it can be applied whether the time series are integrated at order 0 [I(0)] or order 1 [I(1)], as long as none of the variables are integrated at order 2 [I(2)]. This characteristic is essential because it helps to avoid some of the spurious regression problems associated with non-stationary series. Furthermore, the ARDL approach allows for modeling long-term relationships while accounting for short-term dynamics, which is crucial for capturing the delayed impacts of public debt on private investment.

For each variable, an ARDL model is defined, considering the appropriate lag structures. The general form of the model can be written as follows:

$$y_t = \alpha_0 + \sum_{i=1}^p \alpha_i y_{t-i} + \sum_{j=0}^q \beta_j X_{t-j} + \varepsilon_t$$

In this model, y_t denotes the dependent variable, X_{t-j} represents the explanatory variables, and ε_t is the error term.

The ARDL model specification employed in this study can be expressed as:

$$INV_t = \alpha_0 + \sum_{i=1}^p \alpha_i INV_{t-i} + \sum_{j=0}^q \beta_j PD_{t-j} + \sum_{k=0}^r \gamma_k PDS_{t-k} + \sum_{l=0}^s \delta_l inf_{t-l} + \sum_{m=0}^t \lambda_k SR_{t-m} + \varepsilon_t$$

In this model, the dependent variable (INV) represents private investment, while the independent variables include public debt (PD), public debt service (DPS), inflation (INF), and the savings rate (SR). Our choice of variables was influenced by the empirical studies of Cecchetti, Mohanty, and Zampilli (2011), Minea and Parent (2012), as well as Checherita-Westphal and Rother (2012).

3.2 Data and Sources of Data

The data collection process for this study required consulting multiple sources. Public debt and debt service variables were sourced from the Manar-Stat platform and the Ministry of Economy and Finance portal. Meanwhile, private Gross Fixed Capital Formation (GFCF), the inflation rate, and the national savings rate were retrieved from the High Commission for Planning website.

4. Results and Interpretations

4.1 Stationarity Test

The stationarity test is a crucial step in time series analysis to determine whether the variables used in the model are stationary, meaning their statistical properties (such as mean, variance, and autocovariance) remain constant over time. Non-stationary data can lead to spurious regression results, which is why it is essential to verify the stationarity of the series before proceeding with the estimation.

The Augmented Dickey-Fuller unit root test results indicate that none of the variables are integrated beyond the first order, which satisfies the necessary conditions for using the ARDL model. The table below provides a detailed summary of the test outcomes:

Table 1: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Method	Statistic	Prob.**
ADF - Fisher Chi-square	158.639	0.0000
ADF - Choi Z-stat	-10.8673	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(UNTITLED)

Series	Prob.	Lag	Max Lag	Obs
D(INF)	0.0444	7	9	33
D(INV)	0.0000	2	9	36
D(PD)	0.0000	0	10	61
D(PDS)	0.0000	0	10	62
D(SR)	0.0000	2	9	36

Source: Author, output from Eviews12 software

4.2. Estimation and Validation of the ARDL Model

Once the stationarity of the variables is confirmed, the next step involves estimating the ARDL model. The estimation process begins by selecting the appropriate lag lengths for the model, which is crucial for capturing the short- and long-term dynamics between the dependent and independent variables. The Akaike Information Criterion (AIC) or Schwarz Bayesian Criterion (SBC) is typically used to determine the optimal lag length, ensuring the model is neither over- nor under-specified.

Selected model (2,2,4,4,0)

Table 2: ARDL Model Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INV(-1)	-0.228738	0.119207	-1.918833	0.0730
INV(-2)	-0.650401	0.144048	-4.515181	0.0004
PD	-0.000121	3.88E-05	-3.122436	0.0066
PD(-1)	0.000158	4.85E-05	3.258061	0.0049
PD(-2)	-2.82E-05	3.91E-05	-0.720771	0.4814
PDS	-0.000103	4.46E-05	-2.305425	0.0349
PDS(-1)	-0.000149	4.19E-05	-3.549905	0.0027
PDS(-2)	-4.15E-05	3.59E-05	-1.154463	0.2653
PDS(-3)	-5.25E-05	3.55E-05	-1.477993	0.1588
PDS(-4)	0.000101	3.57E-05	2.818737	0.0124
INF	-0.930592	0.310586	-2.996243	0.0085
INF(-1)	0.523743	0.450931	1.161470	0.2625
INF(-2)	0.716209	0.466826	1.534212	0.1445
INF(-3)	0.655717	0.500019	1.311385	0.2082
INF(-4)	0.981023	0.464703	2.111074	0.0509
SR	0.498125	0.132183	3.768437	0.0017
C	45.67914	8.472091	5.391720	0.0001
R-squared	0.886210	Mean dependent var	30.85758	
Adjusted R-squared	0.772421	S.D. dependent var	2.450259	
S.E. of regression	1.168903	Akaike info criterion	3.456392	
Sum squared resid	21.86134	Schwarz criterion	4.227320	
Log likelihood	-40.03047	Hannan-Quinn criter.	3.715786	
F-statistic	7.788145	Durbin-Watson stat	2.126235	
Prob(F-statistic)	0.000086			

Source: Author, output from Eviews12 software

The model was validated through an autocorrelation test conducted over 28 lags, which confirmed the complete absence of autocorrelation in the residuals of the estimated model. As a result, the ARDL (2,2,4,4,0) model is statistically validated and explains 88% of the dynamics of private investment.

Figure 1: Results of the Serial Autocorrelation Test

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
		1	0.309	0.309	3.4365	0.064
		2	-0.181	-0.306	4.6611	0.097
		3	-0.091	0.093	4.9821	0.173
		4	0.009	-0.053	4.9851	0.289
		5	-0.070	-0.086	5.1900	0.393
		6	-0.089	-0.030	5.5303	0.478
		7	-0.200	-0.241	7.3136	0.397
		8	-0.225	-0.125	9.6545	0.290
		9	-0.191	-0.217	11.408	0.249
		10	0.030	0.062	11.453	0.323
		11	-0.031	-0.252	11.504	0.402
		12	-0.053	-0.009	11.660	0.473
		13	0.067	-0.042	11.918	0.534
		14	0.102	-0.093	12.546	0.563
		15	0.051	-0.027	12.714	0.624
		16	0.070	-0.095	13.051	0.669

Source: Author, output from Eviews12 software

The cointegration test by Pesaran et al. (2001) was conducted, and the results are summarized in Table 3:

Table 3: Results of the Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	24.36211	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Author, output from Eviews12 software

The results of the Bounds Test indicate a significant long-term relationship between the variables in the model. The F-statistic value of 24.36211 is well above the upper bound critical values (I(1)) at all significance levels (10%, 5%, 2.5%, and 1%). This confirms the rejection of the null hypothesis of no levels relationship, meaning that a cointegrating relationship exists between the dependent variable and the explanatory variables in the ARDL model. Therefore, the variables are found to be cointegrated, supporting the presence of long-term equilibrium dynamics in the model.

A - Estimation of the Short-Term Relationship

The estimation of the short-term relationship is derived from the error correction model (ECM), which is part of the ARDL approach. The ECM captures the short-term dynamics and shows how quickly the variables adjust to restore equilibrium after a deviation from the long-term relationship. The results of this estimation are presented below:

Tableau 4 : modèle à correction d'erreur

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1))	1.933771	0.200160	9.661143	0.0006
D(Y(-2))	1.171033	0.220528	5.310145	0.0060
D(Y(-3))	1.805750	0.265187	6.809357	0.0024
D(DP)	-0.000156	4.57E-05	-3.417758	0.0268
D(DP(-1))	-0.000108	4.49E-05	-2.398003	0.0745
D(DPX)	-0.000393	8.00E-05	-4.914187	0.0080
D(DPX(-1))	0.000141	9.38E-05	1.504020	0.2070
D(DPX(-2))	-0.000227	9.01E-05	-2.524147	0.0651
D(DPX(-3))	-0.000580	0.000138	-4.201851	0.0137
D(INF)	6.147099	0.699937	8.782366	0.0009
D(INF(-1))	-4.576003	0.613934	-7.453576	0.0017
D(INF(-2))	0.860795	0.702016	1.226176	0.2874
D(INF(-3))	-2.392456	0.625011	-3.827863	0.0187
D(EPN)	-0.688654	0.286408	-2.404446	0.0740
D(EPN(-1))	1.578791	0.272554	5.792589	0.0044
D(EPN(-2))	0.875963	0.267210	3.278180	0.0306
D(EPN(-3))	1.356861	0.226556	5.989080	0.0039
CointEq(-1)*	-2.664204	0.243060	-10.96109	0.0004
R-squared	0.977792	Mean dependent var		0.202626
Adjusted R-squared	0.935842	S.D. dependent var		4.849003
S.E. of regression	1.228222	Akaike info criterion		3.483734
Sum squared resid	13.57677	Schwarz criterion		4.347625
Log likelihood	-29.03040	Hannan-Quinn criter.		3.740614
Durbin-Watson stat	2.179572			

Source: Author, output from Eviews12 software

The table presents the results of the ECM (Error Correction Model) regression for the short-term dynamics of the model. Key details include:

- **D(INV(-1))**: The lagged value of private investment has a significant positive coefficient (0.650401), suggesting a strong influence of past investment on current investment in the short term.
- **D(PD)** and **D(PD(-1))**: Public debt and its lag show no significant effect in the short term, as indicated by the t-statistics and p-values.
- **D(PDS)** and its lags: Public debt service and its lagged values also show no significant short-term impact.
- **D(INF)**: Inflation has a significant negative short-term impact on private investment, particularly at lags 1, 2, and 3, as indicated by the negative coefficients and low p-values.
- **CointEq(-1)**: The error correction term (ECT) is negative and highly significant (-1.879139, p-value = 0.0000), indicating that deviations from the long-term equilibrium are corrected fairly quickly. The magnitude of this coefficient suggests a strong adjustment towards equilibrium in each period.

The goodness-of-fit measures (R-squared = 0.946710, Adjusted R-squared = 0.918797) indicate that the model explains a high proportion of the variation in private investment. The Durbin-Watson statistic (2.126235) suggests that there is no significant autocorrelation in the residuals.

The results of the ECM regression indicate that public debt (PD) and public debt service (PDS) do not have a statistically significant short-term impact on private investment, as seen by their high p-values. This suggests that in the short run, there is no strong crowding-out effect where government borrowing directly reduces the availability of credit for the private sector. One possible explanation for this lack of short-term significance is that financial markets may be sufficiently liquid, or monetary policies are managing interest rates effectively, preventing the rise in public debt from immediately increasing borrowing costs for private firms. Additionally, the market may perceive the increase in public debt as temporary, mitigating any short-term concerns. However, the significant error correction term (ECT) indicates that the system adjusts toward long-term equilibrium, where public debt may exert a more substantial influence. While the crowding-out effect is not evident in the short term, the accumulation of public debt and the associated debt service costs could have more significant implications for private investment over the long term, particularly if interest rates rise or the

debt burden becomes unsustainable. Thus, the absence of short-term crowding-out does not preclude the risk of long-term effects.

B - Estimation of the Long-Term Relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PD	4.55E-06	1.76E-06	2.590443	0.0197
PDS	-0.000130	4.07E-05	-3.204453	0.0055
INF	1.035634	0.230215	4.498546	0.0004
SR	0.265081	0.082619	3.208469	0.0055
C	24.30854	2.641683	9.201917	0.0000
EC = INV - (0.0000*PD - 0.0001*PDS + 1.0356*INF + 0.2651*SR + 24.3085)				

Source: Author, output from Eviews12 software

The table Bellow provides the long-term estimation results for the ARDL model, showing the relationships between public debt (PD), public debt service (PDS), inflation (INF), and savings rate (SR) on private investment (INV).

- **Public Debt (PD):** The coefficient for public debt is positive (4.55E-06) and statistically significant (p-value = 0.0197), indicating that in the long term, an increase in public debt has a positive effect on private investment.
- **Public Debt Service (PDS):** The coefficient for public debt service is negative (-0.000130) and statistically significant (p-value = 0.0055), suggesting that a higher debt service burden crowds out private investment in the long term.
- **Inflation (INF):** The coefficient for inflation is positive (1.035634) and highly significant (p-value = 0.0004), meaning that inflation has a positive long-term effect on private investment.
- **Savings Rate (SR):** The savings rate also has a positive and significant coefficient (0.265081) with a p-value of 0.0055, implying that higher savings contribute to increased private investment in the long term.
- **Constant (C):** The constant term is 24.30854 and highly significant (p-value = 0.0000), indicating the base level of investment when all other variables are held constant.

The equation for the long-term equilibrium (EC) is as follows:

$$EC = INV - (0.0000*PD - 0.0001*PDS + 1.0356*INF + 0.2651*SR + 24.3085)$$

- The positive relationship between public debt and private investment in the long term suggests that public borrowing may stimulate private sector growth, possibly due to productive public investments.
- However, the negative effect of public debt service indicates that the cost of repaying debt reduces the resources available for private sector investment, highlighting the importance of debt sustainability.
- Inflation and savings both have a positive long-term impact on private investment, with higher savings contributing to more available capital for investment and inflation potentially indicating an expanding economy.

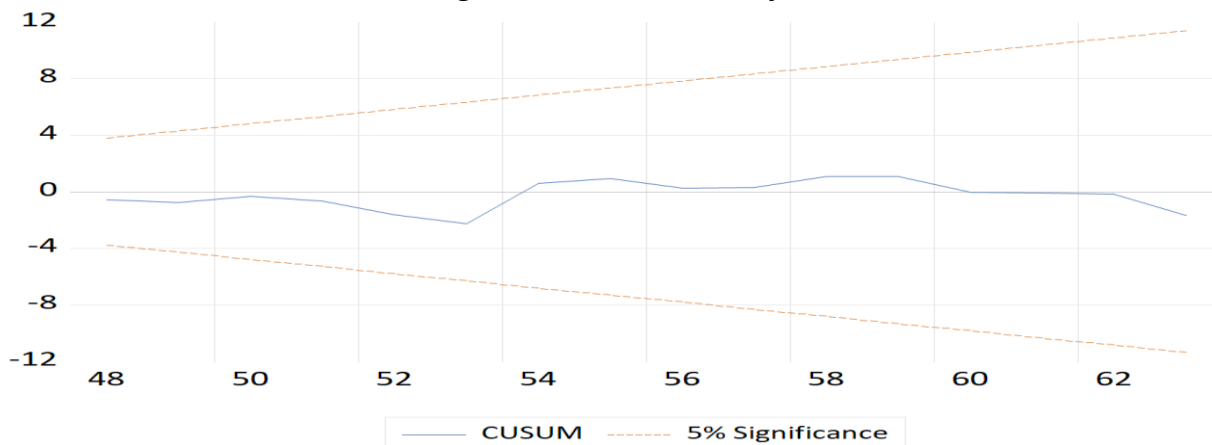
Overall, the long-term results suggest a nuanced interaction between public debt and private investment, with both positive and negative effects depending on the component of debt considered (debt vs. debt service).

C- Model Stability Test

The stability of the model is a crucial aspect to verify after estimating an econometric model like the ARDL. Ensuring that the model's coefficients remain constant and that the results are reliable throughout the study period requires performing stability tests.

CUSUM Test (Cumulative Sum of Recursive Residuals) is used to examine the stability of the model's coefficients over time. It checks whether the cumulative residuals of the model stay within the 5% confidence bands. If the CUSUM plot remains within these bands, the model is considered stable.

Figure 2: CUSUM Stability Test



Source: Author, output from Eviews12 software

since the CUSUM line stays within the confidence intervals, the model can be considered structurally stable and appropriate for making inferences based on the estimated relationships between the variables.

Conclusion

The findings from this study provide significant insights into the crowding-out effect of public debt on private investment. While public debt itself may not immediately hinder private sector activity in the short term, the results show that the long-term impact of public debt service is more concerning. Specifically, as the government increases borrowing, particularly if it leads to higher debt service costs, there is a clear crowding-out effect where fewer resources are available for private sector investment.

The negative and statistically significant relationship between public debt service and private investment highlights the risks associated with high levels of government debt. This crowding-out effect occurs because public debt repayment absorbs financial resources that would otherwise be available to businesses for capital investments. Over time, this reduction in credit availability can slow private sector growth and limit economic development.

The results suggest that, while public debt can be used to finance important public projects and stimulate the economy in the short run, it is critical to monitor and manage the cost of debt repayment. If debt levels become unsustainable, the long-term crowding-out of private investment could offset the initial benefits of public borrowing.

In conclusion, managing public debt sustainably is essential to avoid adverse effects on private investment. Policymakers should focus on strategies that balance the need for public investment with the risk of crowding out the private sector, ensuring that public debt levels do not undermine the economy's capacity for growth. Maintaining a healthy balance between public and private sector investment will be key to fostering sustainable economic development.

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