Investigating the Corruption - Currency Depreciation Nexus in Anglophone Sub-Saharan Africa (SSA): A Focus on the GHS/$ USD relationship

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Paper presented at the 2025 ASSA Annual Meeting held on January 3–5, 2025 (Friday, Saturday, Sunday) at the Hilton San Francisco Union Square San Francisco, CA

Abstract

Corruption and currency depreciation (CD), both critical challenges of economic development in anglophone Sub-Saharan Africa (SSA), tend to occur together and have been persistent in the post-colonial history of anglophone SSA countries, especially Ghana. While both phenomena can contribute to growth, they are more famous for reducing growth. Thus, corruption and CD can both undermine SSA countries' efforts to achieve the United Nation (UN)'s Sustainable Development Goals (SDGs).

In the 1980s and 1990s most anglophone SSA countries, Ghana included, liberalized their economies and eliminated fixed exchange rates and trade restrictions following adoption of the International Monetary Fund (IMF)'s Structural Adjustment Programs (SAPs). The Ghana cedi – United States dollar (USD) exchange rate is therefore currently determined by market forces, meaning as corruption rises, the currency may depreciate. However, it is reasonable to suggest, also, that the weakened currency may increase corruption in Ghana, pointing to possible double causation between corruption and CD.

Using annual data from 1995 to 2021, we employ the Corruption Perception Index (CPI), a perception-based, indirect measures of corruption, to investigate the Corruption - Currency Depreciation nexus for Ghana using both an Autoregressive Distributed Lag (ARDL) and a Non-Linear-Autoregressive Distributed Lag (NARDL) model. While the NARDL model results cannot confirm asymmetry, the Bounds test confirms cointegration in the long run, justifying the estimation of the ARDL-ECM instead of the NARDL. Further, corruption is positively related to CD in the short term in the ARDL estimation. A one percent increase in corruption results in a 4.57 percent increase in currency depreciation.

The finding of a positive relationship between corruption and CD in the short run, and cointegration between them in the long run, suggests that difficult anti-corruption efforts such as increasing transparency through enhanced media freedom, reviewing the constitution (to eliminate conflicts of interest, guarantee the independence of the Bank of Ghana, reduce the power of the executive, and separate the executive from the legislature) as well as holding powerful government officials to account by removing indemnity clauses, are justified. Reducing corruption can not only improve governance, and reduce poverty, but can also stabilize the currency which can help reduce inflation, stabilize the macroeconomy, lower poverty levels and help Ghana achieve the Sustainable Development Goals (SDGs).

Key words: Corruption, Currency Depreciation, Anglophone, SSA, SAPs, SDG and ARDL

JEL Classifications: 01 Econ Development; F31 Foreign Exchange and D 73 corruption

1. INTRODUCTION

Despite diverse economies and vast opportunities for transformation, most Sub-Saharan Africa (SSA) economies still struggle with persistent structural and economic challenges. Among these challenges, corruption and currency depreciation significantly influence development outcomes. The nexus between corruption and currency depreciation remains a pressing yet underexplored topic, particularly in a region where fragile institutions and external shocks amplify the impact of governance inefficiencies. This paper explores the corruption-currency depreciation nexus for Ghana, an anglophone, SSA country that does not belong to a currency union, and is, therefore, likely to be more prone to corruption induced inflation and CD than its francophone neighbors who do belong to a currency union.

The World Bank defines corruption as "*the abuse of the public trust for private gain* (World bank 1997a p 8). The Association of Certified Fraud Examiners (ACFE) categorizes corruption as a form of fraud. The ACFE formally defines corruption *as a scheme in which an employee misuses their influence in a business transaction in a way that violates their duty to the employer to gain a direct or indirect benefit e.g., schemes involving bribery* or conflicts of interest (ACFE 2024 , p 103). In comparison, currency depreciation (CD) refers to the decline in a local currency's value relative to a major international currency, such as the USD (Ofori-Abebrese et al 2017, p 370). In this research, CD is simply the GHC/USD exchange rate. Corruption and CD are both prevalent challenges of economic development in anglophone SSA. They tend to occur together especially in Ghana where corruption's impact on the Ghanaian currency may be more direct because Ghana, like other anglophone SSA countries, does not belong to a currency union and so can arbitrarily increase its money supply.

While corruption and CD can theoretically contribute to economic growth, their negative effects, such as reducing investor confidence, increasing transaction costs, and distorting resource allocation, tend to reinforce each other, leading to economic instability. Ghana's post-colonial history exemplifies this dynamic, as corruption and depreciation have persisted despite various policy interventions. Note that currency depreciation, as used here, refers to a weakening of the Ghana currency, where more Ghana cedis is exchanged for a single USA dollar over time.

Theoretical perspectives on corruption's economic role remain debated. The *"grease the wheels"* hypothesis suggests that corruption can improve efficiency by circumventing bureaucratic bottlenecks and boosting productivity (Chen & Yang, 2024 p1; Antwi, 2020 p 166; Meon, 2005, p3; Leff, 1964 p11). Similarly, under favorable conditions and subject to satisfying the Marshal-Lerner conditions, currency depreciation could boost export competitiveness (Abere, 2023, p1; Rose, 1991, p1). However, the *"sand the wheels"* hypothesis contends that corruption increases transaction costs, reduces efficiency, and deters investment (Antwi, 2020 p 166, Chen & Yang, 2024, p1, Meon, 2005, p3 and Gyimah-Brempong, 2002, p186). Likewise, according to Edwards (1989) currency depreciation, which can cause exchange rate misalignment, often signals fundamental economic weaknesses, discouraging investment and lowering per capita income and may lead to crisis (Havi, 2017, p155). Thus, corruption and currency depreciation can also be detrimental to an economy.

The relationship between corruption and currency depreciation is likely bidirectional. Corruption erodes economic confidence, increasing inflation and weakening the currency, while persistent depreciation worsens budget deficits, external debt, and inflationary pressures, creating further opportunities for corrupt practices. This raises several questions: Does corruption contribute to Ghana's currency depreciation? If so, what is the size and direction of this effect? Is the relationship bidirectional? Is it asymmetrical or symmetrical? Does it differ in the short and long run? Understanding these dynamics is crucial for policy formulation, not only for Ghana but for other anglophone SSA economies facing similar challenges.

Unlike francophone SSA countries, which belong to currency unions that restrict monetary expansion, anglophone nations such as Ghana can print money or adjust the money supply at will. This discretionary monetary policy has, at times, been exploited by political elites, either for electoral advantage, short-term economic gains or personal enrichment. Ghana's shift from fixed to floating exchange rates following the Structural Adjustment Programs (SAPs) in the 1980s and 1990s (Aryeetey and Fosu, 2008) has left the cedi vulnerable to speculative activity and mismanagement, particularly under corrupt regimes. In addition, the transition from fixed to floating exchange rates has not prevented persistent depreciation of the Cedi. In fact, periods of heightened corruption have often coincided with severe currency depreciation.

The exchange rate is a crucial indicator of economic stability (Agyepong et al 2024 p1). In Ghana, currency depreciation, understood to mean consistent losses in the value of the Ghana cedi is often politicized, particularly during election cycles. For example, in the lead-up to the 2016 elections, then-opposition candidate Dr. Mahamudu Bawumia linked corruption in the ruling National Democratic Congress (NDC) to the Ghana cedi's 290% depreciation between 2008 and 2016 (Bawumia 2014). Ironically, under his tenure as vice president, the Ghana cedi depreciated even further—from 3.9 GHS/USD in 2016 to 16 GHS/USD (403%) by mid-2022. This raises the question of whether corruption is truly a key driver of depreciation as Bawumia asserted, or whether other structural factors play a more significant role in explaining currency depreciation.

The International Monetary Fund (IMF) has often highlighted Ghana as a success story of its SAPs and Economic Recovery Programs (ERPs) (Sakyi, 2011, p147). However, critics argue that these programs, by liberalizing the economy and exposing it to external shocks, may have exacerbated long-term currency instability. Some economists contend that corruption undermined the intended benefits of these reforms, contributing to the cedi's persistent depreciation and economic stagnation (Ocran, 2019 and Ndulu et al 2008). By weakening domestic industries and increasing reliance on imports, SAPs inadvertently made Ghana more vulnerable to external currency shocks and capital flight.

Historical trends suggest a strong perception of the correlation between corruption and currency depreciation in Ghana. The 2007 redenomination of the cedi, meant to stabilize the economy, provided only a brief respite before depreciation resumed. In 2022, the cedi was declared the world's worst-performing currency by Moody's and Fitch, with Ghana's sovereign bonds downgraded to junk status (Ayiah-Mensah et al, p736 2023). Given this context, it is crucial to determine whether corruption directly contributes to exchange rate volatility or whether broader economic forces are at play.

This study addresses a critical research gap by empirically examining the corruption–currency depreciation nexus in Ghana. While significant literature exists on the determinants of exchange rate movements (Coulibaly and Marouane, 2024, p1) and on currency crisis (Krugman, 1979 and the related extant literature), few studies, save Bahmani and Nasir (2002), Erhioyovwe (2013) and Dung and Okereke (2022) and a few others, specifically analyze the impact of corruption on the currency value in SSA countries with a floating exchange rate system. Existing research on Ghana's exchange rate dynamics (Agyapong et al 2024, Ayiah-Mensah et al 2023 and Havi, 2017) largely overlooks corruption as a factor and focus on forecasting instead of econometric models in analyzing the exchange rate and currency depreciation. This paper aims to fill this gap by econometrically investigating the corruption-CD nexus for Ghana using Transparency International's Corruption Perception Index (CPI).

We contribute to the literature in three major ways. First, we focus on the impact of corruption on currency value in Ghana which is an anglophone SSA country with floating exchange rates but does not belong to a currency union. This is one of the few papers to do so. Second, using recent annual data (1995 to 2021), we employ the EC-ARDL, the Error Correction version of the ARDL model by Peseran and Shin (2001) as well as the NARDL, the Nonlinear Autoregressive Distributed Lag model by Shin, Yu, & Greenwood-Nimoh (2011) and the Bounds test of cointegration to examine the short and long run as well as possible non-linear and cointegration relationships between corruption on currency depreciation. The EC-ARDL and NARDL models are particularly suited for small sample sizes, allow the detection of time-dependent relationships while accommodating the possibility of cointegration and different orders of integration of the variables. In addition, the NARDL can also be used to test for symmetry. Finally, we use recent data available for all variables (1995 to 2021) to interrogate the corruption-CD nexus. The research findings should provide valuable insights for policymakers in Ghana and other anglophone SSA countries seeking to mitigate exchange rate instability through governance reforms and anti-corruption efforts. The rest of the paper is organized as follows: Section 2 is the literature review. Section 3 discusses the econometric model as well as empirical procedures used in the research. Section 4 presents and discusses the results. Section 5 concludes the paper.

2. LITERATURE REVIEW

2.1. A Discussion of the Different Generations of Currency Crisis Models – The Fixed Exchange Rate Case

The currency depreciation literature has traditionally focused on currency crisis models depicting economies with fixed or pegged exchange rates that failed due to different reasons spawning the different generation of crisis models we know today. According to Breuer (2004) the first-generation models of currency crises, originally formulated by Krugman (1979) in response to the currency crisis in Latin America, relate currency crisis to the quality of economic fundamentals. Economies may or may not be able to fight off speculative attacks and may suffer an eventual crisis based on how strong the economic fundamentals are. This means currency crises are predictable even if not avoidable.

Dissatisfaction with the first-generation crisis models when they failed to predict the currency crisis in Mexico and Europe which occurred despite strong fundamentals led to the

emergence of second-generation crisis models (Breuer 2004). Second generation models, due to Obstfeld (1994) and Calvo (1995), Eichengreen et al. (1996), and Cole and Kehoe (1996) incorporate self-fulfilling expectations that may undermine the currency, despite strong fundamentals.

Third generation crisis models, initiated by Krugman (1998), combine currency and banking crisis, the so-called "twin crisis" models and explain the crisis as an outcome of overborrowing by corrupt developing country governments for unproductive projects. Third generation currency crisis models were developed in response to the Asian financial crisis which was not correctly predicted by either the first or second crisis models. Notable contributors to the third generation models include Calvo (1995), Miller (1996), and Sachs et al. (1996).

The still evolving fourth generation models of currency crisis seem to focus more on corruption and analyze institutional factors such as voting, checks and balances, including rule of law, trust, ethnic tensions, culture, social norms, property rights, legal origin, and types of governance be it over the financial sector or the trade sector, on the genesis of currency crisis (Breuer 2004). However, despite a stronger focus on corruption related issues, since these currency crisis models focus on fixed exchange rate system, they may not be entirely applicable to the economy of an anglophone SSA country like Ghana with floating exchange rates suffering from both corruption and speculative attacks. The third and fourth generation crisis models may apply in part to the anglophone SSA case, but we provide the aegis on crisis models here primarily for completeness and to illustrate the evolution of knowledge on the subject.

2.2. A Review of Currency Crisis Literature in Developing Countries with Floating Exchange Rates

There are several channels through which corruption can contribute to currency depreciation in an open economy with floating exchange rates although the relationship between corruption and currency depreciation may be often indirect instead of direct. Thus far, the empirical literature has some discussion of these mechanisms, but articles testing and analyzing the relationships between corruption and currency depreciation for anglophone SSA countries using econometric modeling is sparse. It is also important to keep in mind that this relationship can be bidirectional.

On the one hand, corruption undermines investor confidence, reduces foreign direct investment (FDI), and potentially hampers economic growth. All these impacts of corruption on direct determinants of the exchange rate can put downward pressure on the local currency. In fact, Habib and Zurawicki (2002) analyze how FDI is impacted by the level of corruption in the host country as well as the absolute difference in the corruption level between the host and home country on FDI. They find that countries with high perceived levels of corruption tend to have weaker currencies because corruption discourages FDI, reducing demand for local currency. Reduction in demand for the local currency with respect to the dollar will lead to the depreciation of the local currency. Corruption is generally frowned upon by foreign investors for creating operational inefficiencies and being wrong. Thus, corruption reduces the attractiveness of the host country to foreign investors. Mismanagement of public resources in corrupt governments can also increase budget deficits and inflationary pressures, and therefore, contribute to depreciation (Tanzi & Davoodi, 1997). Poor governance is often associated with corruption, which can erode confidence in currency and lead to depreciation due to weakened economic fundamentals (Alobied, 2022 and Dada & Oyeranti, 2012)

On the other hand, currency depreciation can increase corruption. First, a depreciating currency can prompt rent-seeking behavior, wherein firms and individuals offer bribes (in

foreign currency) to access scarce foreign exchange, especially under capital controls. Second, depreciation often leads to inflation, which reduces real wages and creates opportunities for public officials to demand bribes or engage in corrupt practices to compensate for the decline in purchasing power (Acemoglu & Verdier, 2000). Saleem et al. (2022) supports this notion by highlighting the positive correlation between currency depreciation and inflation, which erodes public sector wages and reduces purchasing power. The decrease in real incomes can encourage rent-seeking and corruption among public officials, who might engage in corrupt practices to offset their income losses (Saleem et al., 2022).

Wadinga &Ahmed (2024) argue that currency depreciation in Nigeria negatively impacts sectors, such as manufacturing, which is reliant on imports, due to increased input costs. This sector-specific burden often incentivizes corruption, as businesses may resort to bribery to access scarce foreign exchange at favorable rates (Opaluwa et al 2010). Therefore, when compounded by governance challenges, currency depreciation can foster corrupt practices that further undermine economic stability and growth.

Chen and Yang (2024) review the theoretical and empirical literature on corruption's role in currency dynamics and find that corruption can positively or negatively affect financial stability. On the one hand, and under stable conditions, corruption can marginally boost growth by reducing bureaucratic delays, which supports currency strength. Conversely, during economic downturns, corruption can exacerbate currency depreciation by weakening investor confidence, facilitating capital misallocation, and promoting high-risk borrowing that destabilizes financial institutions (Chen & Yang, 2024).

Using examples from the Asian and European financial crises, Chen and Yang (2024) illustrate how currency devaluation can amplify corruption's adverse effects. Their model, which draws from Krugman's third-generation crisis framework, emphasizes that open economies with significant bureaucratic corruption are particularly vulnerable to depreciation. Corruption can lead to currency crisis through the interconnected effects on foreign debt, capital flight and credit risk. Furthermore, the empirical studies in Chen and Yang (2024) also highlight corruption's impact on currency markets. Corrupt officials often misuse foreign exchange reserves or manage exchange rates to benefit insiders, leading to unsustainable currency policies. Also, they argue that countries with high corruption levels experience reduced FDI inflows, which devalue their currencies over time, as demonstrated by the works of Mauro (1995) and Goel and Hasan (2011). In summary, they emphasize the dual effect of corruption on currency values: Corruption can temporarily mask economic inefficiencies in times of growth or deepen currency crisis during economic distress.

In one of the few available papers focused on investigating the corruption-currency depreciation nexus for anglophone SSA, Erhioyovwe (2013) investigated the impact of corruption and FDI on the Nigerian Naira-USD exchange rate using annual data spanning 1980-2011 and regression techniques after testing for stationarity and cointegration. The short run result revealed that corruption is very high in Nigeria and causes significant depreciation of the Nigerian currency, the Naira, against major international currencies like the US dollar.

2.3. A Review of Empirical Literature Related to Currency Depreciation & Currency Crisis in Ghana

Dung and Okereke (2022) empirically examined the determinants of exchange rate in Anglophone West African countries such as Gambia, Ghana, Liberia, Nigeria, and Sierra Leone between 1981 and 2019. They employed Panel Least Square (PLS) estimation methods to analyze the data. The research concluded that inflation rate, interest rate, current account balance and terms of trade caused exchange rate depreciation in these anglophone West African

countries but did not consider the influence of corruption on currency depreciation. Dung and Okereke (2022) discuss fundamental theories of exchange rate determination including (i) The elasticity approach and the Marshall Lerner conditions (ii) The balance of payment approach (iii) The monetary approach (iv) The Purchasing Power Parity Approach (v) The covered and uncovered interest rate parity approach and the traditional model. However, they do not focus on the relationship or inter-relationships between corruption and currency depreciation.

By applying ARIMA and SARIMA models Ayiah-Mensah (2023) forecast future exchange rates of the Ghana Cedi against the USD. The study used a 13-year data of exchange rates of Ghana Cedi and the USD spanning from 2010 to mid-2023 from the Bank of Ghana's economic data on exchange rates, Ghana Stock Exchange and the World Bank. The ARIMA and SARIMA models used to model the trends and for forecasting took into consideration the asymmetric and seasonal effect of the data. However, even though they did not focus on the corruption, the model results predict that the Ghana cedi will continue to appreciate against the USD for the remaining months of 2023 except in December and continue to decline afterwards into 2024.

In their 2019 paper, Nketsiah et al (2019) examined the impact of remittance on the real exchange rate in Ghana. The data used spanned 1970-2016 and data sources included the World Bank's Development Indicators (WDI). Trade openness, government public debt, remittance, terms of trade, capital flow were used as independent variable while the real exchange rate as the dependent variable. Using the Ordinary Least Squares (OLS) estimator, the study established that government public debt, trade openness and capital flow had significant impact on real exchange rate in Ghana. The study also established that remittance and terms of trade have no significant impact on real exchange. However, Nketsiah et al (2019) also did not consider the effect of corruption on the exchange rate

Enu (2017) investigated the key determinants of Ghana's exchange rate depreciation by decomposing the explanatory variables into their component parts. Time series data from 1980 to 2015 was used. The results concluded that agricultural output, industrial output, services output and exports significantly affected the exchange rate of the Ghana Cedi against the US dollar. The effect on the exchange rate of key institutional variables like corruption was not addressed by Enu (2017) and so we take it up in this paper.

Azaglo (2020) tested the Productivity Bias Hypothesis (PBH) for Ghana by investigating if increasing productivity in Ghana will prove to be an effective strategy to stabilize the Ghana Cedi-USD exchange rate in Ghana by employing Zakaria and Ahmad (2009)'s model to test the PBH for Ghana and 7 of its major trading partners: USA, UK, China, India, South Africa, Netherlands, and Switzerland. The variables used in the model included nominal exchange rate, price levels, productivity indices and data spanned from 1983 to 2018. The research concluded that the PBH holds for Ghana and that the exchange rate will stabilize given robust economic growth but did not focus on corruption.

Using multinomial logistic regression and monthly data from 1990 to 2016, Havi (2017) investigated the determinants of currency crisis in Ghana. A composite variable, the exchange market pressure index was constructed and specified into 3 categories: appreciation, depreciation in exchange market pressure and reference point where there is no need for exchange market pressure to rise or fall. Havi (2017) based the pressure index on Eichengreen et al (1995)'s index. Eichengreen et al (1995) directed that in computing an exchange market pressure index a change in nominal exchange rate, foreign exchange reserves and interest rates should be included so Havi (2017) used those variables in his research. The study concluded

that due to the appreciation in the exchange market pressure index, growth rate of domestic credit and growth rate of output are significant determining factors of currency crises. However, Havi (2017) did not consider corruption in their analysis and is the gap in the literature we will fill by investigating the corruption-currency depreciation-nexus for Ghana.

According to Junejo (2019) and Breuer (2004), the determinants of currency crises, particularly in the context of fixed exchange rates, have been extensively studied in the literature, beginning with Krugman (1979). This body of research has evolved through multiple generations of crisis models. The first-generation models (Krugman, 1979; Flood & Garber, 2008; Agénor et al., 2011) emphasize the role of inconsistent fiscal and monetary policies in triggering speculative attacks. Second-generation models (Obstfeld, 1994; Calvo, 1995; Eichengreen et al., 1996; Cole & Kehoe, 1996) highlight the role of self-fulfilling expectations and government credibility in currency crises. Third-generation or twin-crisis models (McKinnon & Pill, 1998; Chang & Velasco, 1998; Krugman, 1998; Corsetti et al., 1998) extend the analysis to financial sector vulnerabilities and banking crises. More recently, fourth-generation models, or institutional models of currency crises (Breuer, 2004), incorporate governance-related factors such as political stability, institutional quality, and corruption.

Despite the extensive theoretical and empirical work on currency crises, there remains a significant gap in the literature regarding the role of corruption in currency depreciation and crises, particularly in developing countries with open economies and floating exchange rates. While studies such as Bhamani-Oskoee et al. (2002), Junejo (2019), and Wei & Wu (2002) have provided valuable insights into the relationship between corruption and exchange rate dynamics, empirical research on this nexus remains limited. Even more scarce is single-country analysis on the corruption–currency depreciation link in Anglophone sub-Saharan African (SSA) countries—such as Ghana, Kenya, Zambia, and Nigeria—where floating exchange rates prevail outside of currency unions. A notable exception is Erhioyovwe (2013), who examined the corruption–exchange rate relationship specifically for Nigeria.

Regarding Ghana, research on currency depreciation has focused largely on macroeconomic determinants rather than the role of corruption. Havi (2017), for instance, analyzed the probability of a currency crisis in Ghana but did not consider corruption as a contributing factor. Similarly, Ayiah-Mensah et al. (2023) examined trends in the Ghana Cedi–USD exchange rate without addressing corruption. More broadly, studies on exchange rate volatility in Ghana, such as Adusei & Gyapong (2017) and Enu (2017), investigate macroeconomic drivers but to best of our knowledge, hardly make mention of corruption.

Given the scarcity of research on the corruption–currency depreciation nexus in Ghana, our study aims to fill this gap by empirically investigating the extent to which corruption influences exchange rate movements using the ARDL model that copes well with limited data even when the series are integrated of different orders. By doing so, we contribute to the broader discourse on the role of institutional quality in currency stability in developing economies.

3. EMPIRICAL MODEL AND ESTIMATION PROCEDURE

3.1. The ARDL, NARDL models and their Error Correction Variants

Our empirical model builds on previous literature, such as the model used by Dung and Okereke (2022) to investigate the determinants of exchange rate in Nigeria and other SSA

countries. However, we specify a time series version of the panel data model they used for SSA countries because we want to focus on Ghana. To account for possible double causation between corruption and exchange rate and to accommodate for possibly different degrees of integration of the rather limited time series data, we estimate empirical model with the Autoregressive Distributed Lag (ARDL) by Pesaran, Shin and Smith (2001) using time series data for Ghana spanning 1995-2021.

The ARDL model is used to analyze the dynamic relationship between variables in the presence of both short- and long-run effects and can be applied regardless of the order of integration in the underlying variables (Antwi et al. 2020 and Pesaran et al., 2001). The model is efficient and particularly suitable for time series data with relatively small sample size, as it provides robust results by allowing different lag structures for each variable in the model (Antwi et al. 2020).

Further, cointegration relationships between non-stationary data will dictate the estimation of the error-correction variant of the ARDL, but this Error correction variant of the ARDL applies subject to Bounds cointegration tests. The error correction (EC) process cointegrates non-stationary variables and tests for the existence of long-run cointegration relationship between the variables by examining the joint significance of lagged levels of the explanatory variables. If cointegration is established, the ARDL model estimates both the short-run dynamics (via EC terms) and the long-run equilibrium relationship between the dependent and explanatory variables (Pesaran et al., 2001).

The general ARDL representation for this analysis can be expressed as:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=0}^{q} \delta_j \Delta X_{t-j} + \sum_{i=0}^{k} \sum_{j=1}^{m} \lambda_{ij} Z_{Jt-i} + \gamma_1 Y_{t-1} + \gamma_2 X_{t-1} + \epsilon_{it} \quad (1)$$

Where Y_{t-i} is the lag of the dependent variable (currency depreciation or the exchange rate) with its coefficients, α_i. X_{t-i} refers to the main independent variable (corruption) and its lags with their coefficients, δ_i and Z_{t-i} refers to all other independent variables and their lags with their coefficients denoted λ_{ij}. Note that m is the total number of regressors apart from corruption while p, q and k are the respective lag lengths of the dependent and independent variables to be determined using the AKAIKE (AIC) optimal lag length selection criteria. γ_1 and γ_2 represents coefficients for the long-term relationships, and ϵ_{it} is the error term which has an identically and independently distributed (*iid*) and normal distribution. $\varepsilon_{it} \sim N(0, \delta^2)$

Ding et al (2017) as cited in Armah & Berkoh (2025) explains that the selection criterion used to choose the optimal lag length in the ARDL is determined by the properties of the sample and the context of the data. In the case where the sample size is large and the data is generated from a finite process, the Bayesian Information Criterion (BIC) is the preferred criterion. However, when the true lag order is unknown, the AIC is the better option (Ding et al 2017 as cited in Armah & Berkoh, 2025). Akaike (1979) argues that within the Bayesian framework, the AIC is the superior information criterion (Akaike, 1979 as cited in Armah & Berkoh, 2025). Given our small and finite sample, the AIC seems to be the better choice and was used as the lag-length selection criterion for this research. By applying the ARDL model, we identify both

the immediate effect of corruption on exchange rate movements and its cumulative long-term impacts.

The ARDL model we employed is specified in equation (2) below:

$$\begin{aligned}\text{Depreciation}_t = a_0 + \sum_{i=1}^{p} \alpha_i \, \text{Depreciation}_{t-1} + \beta_1 \text{Corruption}_t + \beta_2 \text{RGDP}_t + \beta_3 \text{Inflation}_t \\ + \beta_4 \text{VoiceAndAccountability}_t + \beta_5 \text{RuleOfLaw}_t + \sum_{i=1}^{p} \delta_{1i} \text{Corruption}_{t-i} \\ + \sum_{i=0}^{q} \delta_{2i} \, \text{RGDP}_{t-i} + \sum_{i=0}^{q} \delta_{3i} \, \text{Inflation}_{t-i} + \sum_{i=0}^{q} \delta_{4i} \, \text{VoiceAndAccountability}_{t-i} \\ + \sum_{i=0}^{q} \delta_{5i} \, \text{RuleOfLaw}_{t-i} + \varepsilon_t \end{aligned} \quad (2)$$

Where, $Depreciation_{t-1}$ is the lag of the dependent variable ; $Corruption_t$, $RGDP_t$, $Inflation_t$, $VoiceAndAccountability_t$, and $RuleOfLaw_t$ are the contemporaneous independent variables with their coefficients β_1-β_5. $Inflation_{t-i}$, $RGDP_{t-i}$, $RGDP_{t-i}$, $VoiceAndAccountability_{t-i}$, and $RuleOfLaw_{t-i}$ are the lags of the independent variables with their coefficients δ_1-δ_1. p and q are the lag lengths of the dependent and the independent variables, respectively. We also test for cointegration using the ARDL Bounds test. If a long-term relationship is confirmed, we will proceed to run the ARDL error correction model.

3.2 Justification of the Model and Estimation Procedures.

The choice of the ARDL-ECM for estimating the corruption-CD nexus is easily justified by the literature. First, the existence of a long-term cointegrating relationship can be tested based on the EC representation of the ARDL. This ECM representation of the ARDL the ARDL-ECM can help to disentangle long-run relationships from short-run dynamics (Peseran, Shin and Smith 2001)

The ARDL-ECM estimates both short-run dynamics and long-run equilibrium simultaneously, allowing us to analyze how corruption shocks impact currency depreciation in the short run and whether persistent corruption levels contribute to long-term exchange rate depreciation (Peseran, Shin and Smith 2001)

The Pesaran, Shin, and Smith (2001) Bounds Test of cointegration employed in the context of the ARDL-ECM helps determine the presence of a long-run relationship between corruption and exchange rates without requiring pre-testing for unit roots. This is particularly useful in studies such as this one where the possibility of mixed integration orders exists (Peseran, Shin and Smith 2001)

The ARDL models provide unbiased and efficient estimates of long-run coefficients, even when some explanatory variables are endogenous (Azenui 2023). This is particularly relevant in corruption-CD studies, where reverse causality is a concern (i.e., corruption influencing exchange rates and vice versa). The Error Correction Model component of the

ARDL measures the speed of adjustment toward long-run equilibrium after a short-term shock (Azenui 2023). This is useful in understanding how quickly exchange rates respond to corruption-induced economic distortions. Given these advantages, the ARDL-ECM model, renown for being a robust and reliable econometric approach for analyzing finite data is appropriate for investigating the corruption–CD nexus, especially in developing anglophone SSA countries like Ghana with floating exchange rates. It provides deeper insights into both short-run volatility and long-run stability, making it a preferred choice for empirical research in this area.

In testing for unit roots, the Augmented Dickey Fuller (ADF) is preferred to the Dickey-Fuller (DF) test because the latter may not account for higher-order serial correlation in the residuals, leading to unreliable results (Dickey and Fuller 1979 and MacKinnon 1994). The ADF test improves on this by including lagged differences of the dependent variable, making it more robust in detecting unit roots. Since the ARDL Bounds Test does not require all variables to be of the same order of integration (unlike Johansen cointegration, which requires all variables to be I (1)) and difference stationary, the ADF test helps determine if the variables satisfy the ARDL requirement (i.e., no I(2) variables) (Pesaran Shin and Smith 2001). If all variables are I (0) or I(1), then ARDL can be used, and the Bounds Test can assess cointegration. If the ADF test finds that a variable is non-stationary (I (1)), differencing it once makes it stationary, allowing it to be included in the ARDL model (Nkoro and Yuko 2016)

In using the ADF test to investigate the existence of unit roots it is often required that an appropriate lag length be selected. Several criteria are available for selecting the lag length including (i) the Schwarz Bayesian Information Criterion (SBIC or BIC), which imposes a stronger penalty for additional parameters, and favors more parsimonious models (ii) the Akaike Information Criterion (AIC)which prioritizes model fit while penalizing excessive parameters (iii) the Hannan-Quinn Criterion (HQC) which is compromise between AIC and BIC, used for robustness checks and (iv) the Likelihood Ratio (LR) Test which Compares nested models to determine if additional lags improve explanatory power. In small samples like we have, AIC is often preferred because it tends to select slightly longer lags that better capture dynamics (1979; Ding 2017 and Armah and Berkoh 2025)

3.3 Testing for Symmetry Relationships with the NARDL Model

The traditional ARDL model assumes a symmetric relationship between variables, implying that the magnitude response of the dependent variable (Y) to a unit increase in the independent variable (X) is identical to the magnitude response of Y to a unit reduction in X. However, this might not be the case, as the magnitude of the effect of an increase in corruption may not necessarily be the same when corruption decreases. For example, if an increase in corruption by 1 percent leads to a 2 percent increase in depreciation, it will not necessarily mean that a 1 percent decrease in corruption will also lead to 2 percent currency depreciation. This is because the dynamics of corruption and anticorruption may differ. If there is a chance that an asymmetric relationship between corruption and depreciation exists, then the Nonlinear Autoregressive Distributed Lag (NARDL) model must be employed. Shin, Yu, and Greenwood-Nimoh (2014) developed the NARDL model for exactly this purpose while acknowledging possible cointegration relationships between variables possibly integrated of different orders. We test for possible asymmetry with equation (3) below:

$$\text{Depreciation}_t = \delta_0 + \sum_{i=1}^{p} \delta_{1i}\, \text{Depreciation}_{t-1} + \sum_{i=1}^{p} \delta_{2i}^{+} \text{Corruption}^{+}{}_{t-i} + \sum_{i=1}^{p} \delta_{3i}^{-} \text{Corruption}^{-}{}_{t-i} + \sum_{i=0}^{q} \delta_{4i}^{+}\, \text{RGDP}^{+}{}_{t-1} + \sum_{i=0}^{q} \delta_{5i}^{-}\, \text{RGDP}^{-}{}_{t-1} + \sum_{i=0}^{q} \delta_{6i}^{+}\, \text{Inflation}^{+}{}_{t-i} + \sum_{i=0}^{q} \delta_{7i}^{-}\, \text{Inflation}^{-}{}_{t-i} + \sum_{i=0}^{q} \delta_{8i}^{+}\, \text{VoiceAndAccountability}^{+}{}_{t-i} + \sum_{i=0}^{q} \delta_{9i}^{-}\, \text{VoiceAndAccountability}^{-}{}_{t-i} + \sum_{i=0}^{q} \delta_{10i}^{+}\, \text{RuleOfLaw}^{+}{}_{t-i} + \sum_{i=0}^{q} \delta_{11i}^{-}\, \text{RuleOfLaw}^{-}{}_{t-i} + \varepsilon_t \quad (3)$$

The NARDL model is also applied in this study to explore the potential for asymmetry because increases in corruption might affect exchange rates differently than reductions in corruption. For example, higher corruption can accelerate currency depreciation, while improvements in governance might only gradually stabilize the exchange rate. Thus, this study provides deeper insights into how changes in corruption and other explanatory variables affect currency depreciation asymmetrically. We acknowledge potential omitted variable bias due to the exclusion of some of key variables that Dung and Okereke (2022) employed for Nigeria such as interest rate, current account balance and terms of trade but argue that for Ghana the variables we included gives us a reasonable fit for the model

3.4 Data Sources and Justification for Control Variables

Data on directly observed or committed corruption is rarely available for developing countries. Due to the difficulty in getting direct measures of corruption. For this reason, the preponderance of corruption research typically employs indirect data such as data on corruption perception such as Transparency international (TI)'s corruption Perception Index (CPI). We use the CPI data in our research. Time series of corruption perception data available for available for SSA countries like Ghana often has a limited range, having only started in the 1990s with missing data for some years in the relevant range (Berkoh, 2021; Armah & Berkoh, 2025). CPI data (from 1995 to 2021) was used in this research because of the CPI's wide use and acceptability in the corruption and economic development literature.

As illustrated in (3) the independent variables used include corruption, inflation, real GDP, voice and accountability and rule of law. In the next session we discuss the relationship between each of these variables and the CD variable proxied by the exchange rate (ER) to get a sense of the sign of the relationship between each variable and the ER. As explained before, since the ER is defined here in GHC/ USD, an increase in the ER reflects currency depreciation.

Table A1: Definition of variables and hypothesized relationships

Variables	Data sources	Definitions	Relationship with CD
Real GDP	World Bank	Real Gross Domestic Product	Ambiguous
Inflation	World Bank	(Change in the price level)	Ambiguous

Voice	World Bank	Voice and Accountability	Negative/Ambiguous
Corruption	Transparency international	Corruption Perception Index (CPI)	Positive/Ambiguous
Rule of Law	World Bank	Rule of Law	Negative/ Ambiguous

3.4.1 GDP and Exchange Rate Depreciation (CD)

The relationship between income or GDP and the exchange rate is ex ante indeterminate because on one hand increasing incomes can cause an appreciation of the Ghana Cedi. However, on the other hand it can cause a depreciation of same. Recall that per our definition of the Exchange rate as GHC/$, a depreciation of the GHC reflects an increasing number of GHC to be exchanged for 1 USD. A depreciation of the GHC is reflected by a positive coefficient between the CD variable and corresponding correlates like the GDP. Recall also that GDP serves as a proxy for market size, reflecting the capacity of an economy to attract foreign investments and imports. Increasing demands for imports leads to an increase in demand for the USD and a decrease in the demand for the Ghana Cedi in Ghana, undermining the value of the cedi vis a vis the USD. By this argument increasing incomes by the income effect will result in increased demand for all goods including USD which is vital in Ghana an import dependent country (Abel et al 2021).

However, a large GDP also represents a larger market, and a larger market size tends to draw international investors and traders, which can influence the exchange rate. The inflow of capital and goods necessitates currency exchanges, impacting the demand and supply of the domestic currency. This relationship between economic activity and international trade is a critical determinant of currency valuation. Per the productivity bias hypothesis (see Azaglo 2020 and Balassa, 1964, as cited in Bahmani-Oskooee, 2002), increasing productivity will result in a stronger currency. Since we capture the effect of productivity increases by increases in the real GDP variable, this means that a negative relationship is between real GDP and ER by this argument. In other words, as real GDP increases GHC/ USD will fall as less cedis will be needed to purchase a dollar so the cedis appreciates versus the USD. Since the GDP variable can cause the Ghana cedi to appreciate or depreciate the sign of the variable is indeterminate and is an empirical question,

3.4.2 Inflation and Currency Depreciation (CD)

Inflation reduces the purchasing power of a currency and erodes confidence in the currency's stability, suggesting that inflation is positively correlated to the ER and currency depreciation. Higher inflation rates make domestic goods less competitive internationally by increasing export prices. Conversely, currency depreciation raises the cost of imports, which businesses often pass on to local consumers, further fueling inflationary pressures. Hence, there seems to be a bi-directional relationship between inflation and depreciation. This means the sign of the inflation currency depreciation variable is an empirical question and can only be resolved empirically.

3.4.3 Voice & Accountability and Currency Depreciation (CD)

Voice and accountability are indicators of institutional quality, reflecting the extent to which a government listens to its citizens and ensures administrative accountability. Strong institutions are better equipped to address fluctuations in exchange rates through sound policies. A country with mechanisms for public participation and accountability is more likely to maintain confidence in its currency, reducing the risk of sharp depreciation. This means that there is a negative relationship expected between the voice and accountability variable and CD.

However, government can choose to pursue policies that leads to currency depreciation to gain a competitive edge in exports, so it is possible to have a positive relationship between depreciation and voice and accountability. The sign of the variable is *ex ante* indeterminate.

3.4.4 Corruption and Currency Depreciation

Corruption can cause currency depreciation through its stimulating effect on inflation and budget deficits and debt and its dampening effect on investments. Since CD is represented by an increasing ER, we expect that corruption will be positively related to CD. In order words, we expect corruption to result in currency depreciation. However, since by the *Grease the wheel* hypothesis (see Meon 2005) corruption can increase efficiency, it is feasible for increased efficiency to lead to productivity gains that will make investment attractive and boost the currency. This will lead to a reduction in currency depreciation as corruption increases. Further, CD can also provide incentives for corruption as it reduces purchasing power. Consequently, there is the possibility of double causation between inflation and CD, making the sign of the relationship between them *ex ante* indeterminate.

3.5 Rule of law and Currency Depreciation (CD)

Rule of law is an indicator of institutional quality, reflecting the extent to which the law is enforced, contracts are upheld, property rights are protected, and loopholes for corruption are eliminated. Rule of law ensures corrupt officials are prosecuted and waste is minimized, leading to efficiency and a favorable investment climate. A country with effective rule of law will increase attract investment and skilled labor, physical capital, and human capital technology capital and by the productivity bias hypothesis, this will lead to appreciation of the Ghana cedi. A negative relationship is expected between CD and rule of law. However, even when governance and accountability are improving, governments can choose to pursue a policy that leads to currency depreciation to gain a competitive edge in exports. So, a positive relationship is also possible. The sign of the variable is *ex ante* indeterminate

4. Results

4.1 Descriptive Statistics

Table 1 below presents the descriptive statistics for key variables used in our study, based on a 27-year annual time frame. Currency Depreciation (CD), defined here to mean an increase in the GHC / $ exchange rate has a mean of 0.161 (SD = 1.132) and ranges from -2.121 to 1.759. The mean, range, and standard deviation of the depreciation variable indicates significant variation in currency movements. The wide range of the data highlights differences in exchange rate dynamics across years in the dataset, possibly influenced by different macroeconomic and policy conditions over the years. The range also suggests fluctuations between appreciation and depreciation years.

The relatively stable corruption perception index (lnCPI) shows that corruption levels have remained constant over time, possibly signaling entrenched systematic issues in Ghana rather than sudden changes. There are clear disparities in economic performance over the years, while we see moderate fluctuations in inflation, implying that inflation has varied over time. These observations in the dataset could be linked to governance quality, policy effectiveness, monetary policy decision, exchange rate movements or fiscal conditions.

Finally, the relatively stable lnVoice shows limited changes in governance and institutional quality that can have implications for long-run economic stability. The relationship between governance, corruption and exchange rate stability will be crucial in understanding the broader economic dynamics of Ghana. Our analysis in the next subsection provides further exploration of the interactions between these variables, particularly in assessing whether corruption plays a significant role in currency depreciation.

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lnER	27	.161	1.132	-2.121	1.759
lnCPI	27	3.665	.112	3.497	3.871
lnGDPPC	27	6.775	.806	5.535	7.768
lnInflation	27	2.732	.612	1.582	4.085
lnVoice	27	4.078	.107	3.784	4.212

4.2 ARDL Model Results

The results from estimating the ARDL model are displayed in Table 2 below. The coefficient of the variable lnCPI, representing the corruption perception index, is negative and statistically significant. The natural log formulation suggests that the coefficient must be interpreted as elasticities. However, recall that lnCPI measures the perception of corruption, where higher values indicate reduction in corruption. Therefore, a negative relationship between lnCPI and the depreciation implies a positive relationship between corruption and currency depreciation. A one percent increase in corruption leads to a three percent increase in the Ghana Cedi depreciation. This result resolves, at least for the case of Ghana, the empirical ambiguity surrounding the corruption - CD relationship in the short run discussed in chapter 3. Recall that Chen and Yang (2024) find the relationship between corruption and inflation to be ex ante indeterminate. They reviewed literature on corruption's role in currency dynamics and found that corruption can positively or negatively affect financial stability and consequently, depreciation. However, in the anglophone SSA context, Erhioyovwe (2013) investigated the impact of corruption and FDI on the Nigerian Naira-USD exchange rate using annual data. Result reveal corruption causes significant depreciation of the Naira, against the USD, which is consistent with our findings for Ghana.

The lagged values of lnCPI exhibit positive and statistically significant coefficients. This implies a negative relationship between the lagged values of corruption and currency depreciation because of how the corruption variable is interpreted. In other words, past record of corruption reduces depreciation, which is contrary to expectations but may reflect anticorruption measures taken to avoid future depreciation. The lagged currency depreciation coefficients show a positive relationship with currency depreciation. The positive coefficients of the lagged lnCPI also suggest that the effect of reduced corruption on currency depreciation may not be immediate but manifest over time. The literature shows that rampant public corruption in emerging markets can repel stable foreign investment, leading to currency crises (Wei and Wu, 2002).

Inflation shows an insignificant negative relationship with the CD variable which translates to mean that contemporaneous inflation does not lead to significant currency

depreciation or is not related to currency depreciation. However, the lags of inflation are negatively and significantly related to the CD variable. This means inflation reduces currency depreciation but with a lag, so it takes a little time for inflation to shore up the currency value. This result is surprising but is not inconsistent with expectations in the literature. The literature contends that the relationship between currency depreciation and inflation may be bidirectional though Armah and Berkoh (2025) and Dung and Okere (2022) both find a positive relationship between inflation and corruption respectively for Ghana and Nigeria (Armah and Berkoh 2025 and Dung and Okereke 2022). The finding of an insignificant contemporaneous inflation effect on corruption but a negative effect of lagged inflation on corruption is not altogether surprising as the literature is inclusive on the magnitude and sign of this relationship.

GDP per capita, is negative and statistically significantly coefficient, indicating that it is negatively correlated with currency depreciation. This means a higher GDP per capita reduces currency depreciation, reflecting economic strength and stability. Azaglo (2020) found that increases in GDP leads to currency appreciation or reduction of currency depreciation which supports findings here and is consistent with the productivity bias hypothesis. According to Abel et al (2016), a positive relationship between income (GDP per capita) and currency depreciation is plausible and can occur due to the income effect and the increased demand for imports associated with increasing income (Abel and al 2016). The mixed signs of the lagged coefficients suggest short-term fluctuations but long-run stabilizing effect of GDP per capita on the Ghanian currency.

Voice and Accountability and its lags, a measure of governance quality, have a positive and significant coefficients which means they are positively correlated with increasing currency depreciation. This result implies that perceptions of participation and government accountability are associated with increased currency depreciation in the short run. This finding, although not expected, may reflect structural adjustments or liberalization policies accompanying governance improvements, which can influence capital flows and exchange rate dynamics. Although surprising at first that improved governance and accountability led to currency depreciation, recall that as Abel et al (2016) explains, if the Marshall Lerner conditions are fulfilled, a declining currency can boost exports and growth. To the extent that accountability and governance is improved, currency depreciation could be an intentional strategy to gain export competitiveness. The effect of government policy would rather be to undermine the currency to boost exports, which will be consistent with our findings here. However, we agree the empirical literature still debates about the sign of this relationship.

Table 2. ARDL Results

VARIABLES	(1) lnDep
L.lnDep	0.836***
	(0.163)
L2.lnDep	-0.372*
	(0.163)
lnCPI	-2.969***
	(0.575)
L.lnCPI	1.331**
	(0.424)

L2.lnCPI	2.803***
	(0.552)
L3.lnCPI	0.434
	(0.242)
lnGDPPC	-0.503***
	(0.103)
L.lnGDPPC	0.374**
	(0.126)
L2.lnGDPPC	-0.0581
	(0.115)
L3.lnGDPPC	-0.634***
	(0.143)
lnInflation	-0.0736
	(0.0677)
L.lnInflation	-0.322***
	(0.0625)
L2.lnInflation	-0.319***
	(0.0553)
L3.lnInflation	-0.468***
	(0.0805)
lnVoice	0.939**
	(0.356)
L.lnVoice	1.521**
	(0.441)
L2.lnVoice	2.787***
	(0.576)
L3.lnVoice	2.925***
	(0.607)
Constant	-30.18***
	(4.954)
Observations	24
R-squared	0.996

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.3 ARDL Bounds Cointegration Test Results

Following Pesaran, Shin, and Smith (2001), the ARDL Bounds cointegration test was conducted to test for possible cointegration between corruption and currency depreciation. The null hypothesis of no cointegration is rejected if the F-statistic exceeds the upper bound at the 5 percent significance level. As shown in Table 3, the F-statistic of 11.608 exceeds the upper bounds of 4.01 and 5.06 at the 5 percent and 1 percent significance levels, respectively. This confirms the presence of cointegration, and we proceed with the ARDL Error Correction Model (ARDL-ECM) to distinguish the short-run effects from the long-run effects.

Table 3. ARDL Bounds Cointegration Results

K	95% Confidence Level		99% Confidence Level		F(w)- Statistic
	Lower Boud Bound	Upper	Lower Boud Bound	Upper	
4	2.86	4.01	3.74	5.06	11.608

The null hypothesis of no cointegration is rejected if the F-statistics is > the upper bound (I_1) for the relevant significance level.

4.4 ARDL Error Correction Model (ARDL-ECM)

The ARDL-ECM model, separates the short-run and long-run effects of corruption on the currency depreciation. Since we confirmed cointegration by the Bounds test, we proceeded to run an error correction model. The results of the ARDL-ECM are presented in Table 4 below.

The variables are in their log form, so each coefficient is an elasticity. In the short run, the CPI exhibits a significant negative relationship with currency depreciation. However, since an increase in CPI implies reduced corruption, as done above, the sign of the coefficient will be interpreted in the opposite way. Since the variables are in their log form all coefficients ae elasticities. A one percent increase in corruption results in a 4.57 percent increase in depreciation. This relationship is consistent for the first lag of CPI, which also has a significant negative coefficient (-3.24). However, the second lag is insignificant. Hence, corruption is positively related to currency depreciation in the short term. This result is consistent with the ARDL results above. Erhioyovwe (2013) found a similar result using data for Nigeria, but Chang and Yang (2024) contend that corruption could promote or undermine currency depreciation, so the finding is consistent with expectations.

The short-run coefficient for GDP per capita is insignificant, although its lags are significant, and positive, which means GDP per capita, or income is positively correlated with depreciation but with a lag. The impact of past GDP per capita is to increase depreciation but with a lag. This result is a little surprising but its consistent with the ARDL results because both a positive and a negative relationship between income and currency depreciation are possible. Abel et al (2017) emphasizes the role of increasing relative demand for imports as income increases pushing up the demand for USD relative to the local currency (the Ghana Cedi) leading to depreciation of the local currency. In comparison by the productivity bias hypothesis of Balassa (See Balassa 1964), increased incomes reflect productivity gains and a well-functioning economy which will attract investment and will lead to currency appreciation.

Inflation has a significant and positive correlation with CD. This means inflation has a positive impact on currency depreciation in the short run; increasing inflation undermines the value of the currency. The coefficients for inflation and its lags are all significant (1.109%, 0.787%, and 0.468%). This suggests inflationary pressures worsen currency depreciation in the short run. Both Erhioyovwe (2013) and Dung and Okereke (2022) concluded that inflation makes depreciation worse in Nigeria. However, although the literature seems to point to a positive relationship between inflation and currency depreciation it also acknowledges a possible bidirectional relationship between inflation and currency depreciation, so this finding is as expected.

Governance quality, measured by Voice and Accountability and its lags, have significant negative coefficients in the short run (-7.234 percent, -5.712 percent, and -2.925 percent). These variables are negatively correlated with currency despeciation. This implies that improved governance reduces currency depreciation in the short term, which differs from ARDL results discussed earlier. However, this result, that improved governance reduces depreciation and stabilizes the currency is also plausible because it results in increased productivity, increased exports and increased demand for the cedi as well as increased investment and inflow of USD which shores up the value of the Ghana cedi.

In the long run, a different pattern emerges with all variables having the exact opposite of the short run relationship with the CD variable and therefore with currency depreciation. This reversal in signs may reflect the outcome of the evolution of the dynamic interaction between the variables and is certainly a remarkable result.

The coefficient of corruption, which was negative in the short run, is now positive. Hence, there is a negative long-run relationship between corruption and depreciation despite the positive relationship between corruption and CD in the short run. A percentage increase in corruption leads to an approximate 3 percent reduction in currency depreciation. This result is strange because it seems to indicate that in the long run corruption can reduce currency depreciation. Recall the *grease the wheel* hypothesis of corruption that claims that corruption can enhance efficiency (see Meon 2005). Ang (2020) explains that specific categories of corruption like access money can lead to prosperity which can even attract significant investment. Investment promotes growth and engenders trust in the macroeconomy which can shore up the currency and reduce depreciation, so it is theoretically plausible for corruption to reduce depreciation in the long run, even though corruption made currency depreciation worse in the short run. However, the result seems strange and is inconsistent with expectation.

GDP per capita (lnGDPPC) which showed a positive relationship with the depreciation variable in the short run, now shows a significant negative relationship (-1.531***), with the currency depreciation variable in the long run. Given the definition of the CD variable, the interpretation is that increasing GDP per capita reduces currency depreciation and stabilizes the local currency in the long run after undermining the currency value in the short run. This is a surprising yet expected result. It differs from the short run results, yet it is consistent with the literature. By the productivity bias hypothesis increases in income should shore up the currency and reduce depreciation as we find here. However, as explained by Abel et al (2021) when income goes up the demand for both Ghana Cedis and USD can go up and it is possible for demand for USD relative to Ghana cedi to go up pushing up the demand for the USD ultimately undermining the local currency. However, we find that in the long run productivity gains win out and the currency stabilizes after depreciating in the short run.

Inflation has a significant negative long-run correlation with the CD variable (-2.207 percent), despite having a positive short run relationship with the CD variable so the interpretation is that inflation reduces currency depreciation in the long run. This indicates that inflationary pressures rather shores up the currency over time reducing currency depreciation. This finding is inconsistent with the conclusions of Dung and Okereke (2022) and contradicts the short run result and most of the literature. However, to the extent that inflation can give a competitive advantage in exports and boost productivity, inflation can, in theory, ultimately help reduce currency depreciation in the long run but the result is puzzling.

Voice and Accountability has a significant positive relationship (15.25 percent) with the CD variable, despite having a negative relationship with CD in the short run. This seems to suggest that governance improvements are associated with increased currency depreciation in the long run. While governance strategies such as exchange rate liberalization in an improved governance environment could aim at undermining the local currency value to gain a competitive edge in exports, the boost in exports and corresponding productivity gains could lead to an appreciation of the currency in the long run as predicted by the productivity bias hypothesis of Bellassa (Balassa, 1964, as cited Bahmani-Osookeee, 2002).

The error correction term is negative and highly significant (-0.536***), confirming the presence of cointegration among the variables. The coefficient indicates that 53.6 percent of deviations from the long-run equilibrium are corrected in each period.

Table 4. Error Correction Model

VARIABLES	(1) ADJ	(2) LR	(3) SR
LD.lnER			0.372*
			(0.163)
D.lnCPI			-4.568***
			(0.793)
LD.lnCPI			-3.237***
			(0.613)
L2D.lnCPI			-0.434
			(0.242)
D.lnGDPPC			0.318*
			(0.138)
LD.lnGDPPC			0.692***
			(0.158)
L2D.lnGDPPC			0.634***
			(0.143)
D.lnInflation			1.109***
			(0.172)
LD.lnInflation			0.787***
			(0.127)
L2D.lnInflation			0.468***
			(0.0805)
D.lnVoice			-7.234***
			(1.244)
LD.lnVoice			-5.712***
			(1.117)
L2D.lnVoice			-2.925***
			(0.607)
lnCPI		2.984***	
		(0.650)	
lnGDPPC		-1.531***	
		(0.244)	

lnInflation		-2.207***	
		(0.329)	
lnVoice		15.25***	
		(1.105)	
L.lnER	-0.536***		
	(0.0792)		
Constant			-30.18***
			(4.954)
Observations	24	24	24
R-squared	0.986	0.986	0.986

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.5 Diagnostic Tests

The diagnostics test shows that, although there is no autocorrelation, there is a heteroskedasticity (see Table 5 and Table 6).

Table 5. Breusch Godfrey LM Test for Autocorrelation

Breusch-Godfrey LM test for autocorrelation chi2	df	Prob>Chi2
17.968	3	0.000

H_0: no serial correlation

Table 6. White Test for Heteroskedasticity

White's test for H_0: homoskedasticity against Ha: unrestricted heteroskedasticity chi2(23) = 24.00 Prob > chi2 = 0.4038 Cameron & Trivedi's decomposition of IM-test chi2	df	p
24.000	23	0.404
17.250	18	0.506
0.790	1	0.376
42.040	42	0.469

Table 7 NARDL Estimation Results

Regression results (variables renamed):

Source	SS	df	MS	Number of obs =	25
Model	0.562	20	0.028	Prob > F =	0.0
Residual	0.008	4	0.002	R-squared =	0.986
Total	0.570	24	0.024	Root MSE =	0.045

_dy	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
L1.ER	-1.140	0.378	-3.020	0.039	-2.190	-0.091
L1.CPI_p	3.255	1.296	2.510	0.066	-0.344	6.853
L1.CPI_n	-0.642	0.784	-0.820	0.459	-2.818	1.533
_x2p						
L1.GDPPC_p	-0.498	0.256	-1.940	0.124	-1.210	0.214
_x2n						
L1.GDPPC_n	-3.011	0.937	-3.210	0.032	-5.612	-0.409
_x3p						
L1.Inflation_p	-0.492	0.159	-3.090	0.037	-0.934	-0.050
_x3n						
L1.Inflation_n	-0.310	0.135	-2.280	0.084	-0.686	0.067
_dy						
d.L1.ER	0.287	0.452	0.630	0.561	-0.969	1.543
_dx1p						
dCPI_p	0.404	0.637	0.630	0.561	-1.365	2.173
dL1.CPI_p	-0.842	0.568	-1.480	0.212	-2.418	0.735
_dx1n						
dCPI_n	-0.376	0.572	-0.660	0.546	-1.963	1.211
L1.CPI_n	0.905	0.497	1.820	0.143	-0.475	2.285
_dx2p						

dGDPPC_p	-0.354	0.154	-2.300	0.083	-0.782	0.073
L1.GDPPC_p	0.316	0.182	1.730	0.158	-0.190	0.822
_dx2n						
dGDPPC_n	-1.415	0.339	-4.170	0.014	-2.357	-0.473
dL1.GDPPC_n	0.808	0.626	1.290	0.266	-0.929	2.545
_dx3p						
dInflation_p	-0.061	0.096	-0.630	0.561	-0.328	0.206
dL1.Inflation_p	0.197	0.068	2.900	0.044	0.009	0.384
_dx3n						
dInflation_n	-0.180	0.093	-1.920	0.127	-0.439	0.080
dL1.Inflation_n	0.191	0.101	1.890	0.132	-0.090	0.472
_cons	-2.085	0.807	-2.580	0.061	-4.326	0.155

Asymmetry statistics:

	Long-run	effect	[+]	Long-run	effect	[-]
Exog. var.	coef.	F-stat	P>F	coef.	F-stat	P>F
lnCPI	2.854	24.930	0.008	0.563	0.939	0.387
lnGDPPC	-0.437	11.650	0.027	2.640	82.890	0.001
lnInflation	-0.431	32.780	0.005	0.271	10.010	0.034

	Long-run asymmetry		Short-run asymmetry	
	F-stat	P>F	F-stat	P>F
lnCPI	12.830	0.023	0.771	0.429
lnGDPPC	34.620	0.004	0.712	0.446
lnInflation	8.695	0.042	0.405	0.559

Note: Long-run effect [-] refers to a permanent change in exog. var. by -1

Table 8

Cointegration Test Statistic	t_BDM	F_PSS
	-3.0160	2.8120
Model Diagnostic	Test Statistic	P-Value
Portmanteau test up to lag 10 (chi2)	35.35	0.0001
Breusch/Pagan heteroskedasticity	.8955	0.3440
Ramsey RESET test (F)	557.2	0.0311
Jarque-Bera test on normality (chi2)	.7145	0.6996

10 percent		5 percent		1 percent	
I(0)	*I*(1)	*I*(0)	*I*(1)	*I*(0)	*I*(1)
2.20	3.09	2.56	3.49	3.29	4.37

F-test critical values from Pesaran et al (2001)

4.6 Analysis of the NARDL Results

4.6.1 Short-run Results

From Table 7, which presents the NARDL results, the short-run results are represented by the "*differenced"* variables. The table provides no evidence of an asymmetric effect of corruption on depreciation, as both the positive and negative shocks of corruption have a statistically insignificant relation to currency depreciation or the exchange rate. The same applies to the lag of corruption, which also shows no significant symmetry effect. Likewise, there is no short-run asymmetric relationship between Real GDP Per Capita and depreciation.

Although the negative response of CD to corruption (-1.425) appears to suggest a significant increasing impact on depreciation, the effect of a positive shock on depreciation is statistically insignificant. Therefore, we conclude that Real GDP Per Capita does not exhibit short-run asymmetry in its relationship with currency depreciation because a Wald test to test the difference in the long and short run responses is impossible to conduct in this instance. Similarly, inflation in the current period (contemporaneous inflation) does not exhibit an asymmetric relationship with currency depreciation, as the coefficients of both positive and negative shocks are insignificant. Although its positive lag shows a significant effect on depreciation, short-run asymmetry cannot be confirmed because the negative lag is insignificant.

Analysis of Long-Run Results

From Table 7 above, there is no confirmed long-run asymmetrical corruption-depreciation relationship because both the positive and negative shocks of lagged corruption are statistically insignificant. Likewise, we cannot confirm an asymmetric relationship between GDP per capita and currency depreciation, nor between inflation and CD. As the upper part of Table 7 shows, although the negative lag of GDPPC is significant, the corresponding positive lag is insignificant. Similarly, while the positive lag of inflation is significant, the corresponding negative lag is statistically insignificant.

The second part of Table 7 presents the coefficients of the long-run cointegration equation, which helps forecast the long-run asymmetric effects. Although there is a significant negative effect of a positive shock of corruption on depreciation, the coefficient of the negative shock is insignificant; hence, there we cannot confirm cointegration.

On the other hand, there is some indication of a long-run asymmetric relationship between GDP per capita and depreciation, as well as between inflation and depreciation. An increase in GDPPC leads to a 0.437 percent decrease in depreciation, whereas a reduction in GDPPC leads to a 2.64 percent decline in depreciation. Similarly, when inflation rises, it leads to a decrease in depreciation of 0.431 percent, whereas a reduction in inflation leads to a 0.271 percent decline in depreciation.

Further there appears to be no evidence of cointegration in the NARDL because, per the Bounds test, the F-statistic value (F_PSS) of 2.812 is less than the upper bound (3.49) for the cointegration test, according to Pesaran et al. (2001) (see Table 8). Hence, we cannot confirm cointegration. We conclude that the NARDL results are unreliable and mostly insignificant. This may be due to the limited data. We ignore the NARDL and maintain the ARDL-ECM results discussed above as the model of choice for this research.

5. Conclusions

This paper interrogated the corruption-currency depreciation nexus for anglophone SSA countries that do not belong to a currency union (CU) as the influence of corruption on currency depreciation may be more direct on such countries compared to their francophone neighbors who do belong to currency unions. In a CU, one country cannot unilaterally increase the money supply either for a competitive edge to boost exports or for corrupt and selfish purposes such as to help win elections or accumulate personal wealth. However, in anglophone countries like Ghana who do not belong to a CU they can and often do increase the money supply seemingly arbitrarily which can cause inflation and currency depreciation

Using Ghana as the focus country, an ARDL-ECM model was estimated using corruption perception data after relevant testing for unit roots and cointegration. Per the results of the ARDL-ECM, which is our model of choice, corruption worsens currency deprecation in the short run but not the long run. However, there is a reversal of the sign of the coefficients of the short run in the long run for all variables including the key corruption variable. Further the NARDL model results are unreliable, so our relevant key results come from the ARDL-ECM because we confirmed cointegration with the Bounds test.

In terms of specific results, the ARDL-ECM model firms that corruption is found to be positively related to depreciation in the short term but not the long term. A one percent increase in corruption results in a 4.57 percent increase in currency depreciation in the short term. Corruption and currency depreciation are cointegrated and move together in the long run. A percentage increase in corruption leads to an approximate 3 percent reduction in currency depreciation in the long run. The short run result that corruption reduces depreciation is consistent with expectation and with empirical findings and seems to validate claims that corruption is contributing to currency depreciation in Ghana and possibly destabilizing the macroeconomy. The long-run result seems surprising at first because it suggests in the long run corruption can reduce currency depreciation. A percentage increase in corruption leads to an approximate 3 percent reduction in currency depreciation so the currency stabilizes. Ang (2020) explains that specific categories of corruption like access money can lead to prosperity which can even attract significant investment and ultimately lead to currency appreciation in the long run. Although this is a plausible explanation, care must be taken as the results appear inconsistent with some findings in the literature. Inflation has an expected positive correlation with currency depreciation in the short run, but the opposite is true in the long run. However, this result seems consistent with the literature. Deliberate government attempts to boost exports by inflating the currency and reducing its value could boost exports and shore up the currency in the long run. The governance variables have a negative relationship with currency depreciation, which means they reduce currency depreciation in the short run but not the long run which seems counter-intuitive but plausible because of possible feedback from depreciation.

These results of the direction, size and time-dependence of the corruption-currency depreciation relationship should help advice policy formulation not only for Ghana but for other anglophone SSA countries as well. Given the consequences of currency depreciation on inflation, and poverty, for an import-dependent, anglophone SSA country with a small manufacturing sector like Ghana, which exports very little value-added goods, Marshall Lerner conditions which guarantee that currency depreciation will enhance growth are not likely to be met so currency depreciation may not support growth and export and rather could make poverty worse a least in the short run. Anticorruption efforts need to be doubled not only to improve governance, but also to help maintain a reliable currency to facilitate trade and business planning, reduce unemployment and poverty, to attract investment and boost growth.

The finding of a positive and symmetrical relationship between corruption and currency depreciation in the short run suggests that difficult anti-corruption efforts suggested by Armah (2016) such as increasing transparency, reviewing the constitution (to eliminate conflicts of interest, guarantee the independence of the Bank of Ghana, expand media freedom, reduce the power of the executive, and separate the executive from the legislature) as well as hold powerful government officials to account are justified. Reducing corruption can not only improve governance, and reduce poverty, but can shore up confidence in the economy in the short run, stabilize the currency, reduce inflation and help Ghana achieve the Sustainable Development Goals (SDGs).

Further studies can investigate the different pathways through which corruption affects depreciation. It is possible that the effects of corruption on currency depreciation are not direct but rather indirect through factors like GDP per capita, inflation and government debt. It is also possible that the indirect effects are of different signs and may attenuate the effect of corruption on currency depreciation by cancelling each other out. While the data range for time series analysis remains very limited, it may be possible to use methods that perform well in small samples such as structural equation models (SEM) which rely on maximum likelihood estimation and do not need large samples.

Limitations

The range of the data (1997-2021) was extremely limited and in fact ignored more recent events since the COVID 19 epidemic such as significant the currency depreciation Ghana suffered in 2022 and again in 2024. Further, while ARDL estimation is applicable in small samples, the reliability may be questionable. Another important limitation is that the limited sample size prevented the use of parametric estimation methods such as instrumental Variable (IV) estimation and Simultaneous Equation Models (SEM) that can potentially address possible endogeneity between corruption and currency depreciation.

Finally due to the hidden and complex nature of corruption follow up qualitative research using interviews of relevant government officials and other stakeholders such as Central band commercial bank officials and operator of forex bureaus in Ghana could have helped explain in greater depth how corruption manifests as currency depreciation in Ghana.

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Appendix

Variance Inflation Factor (VIF) Test of Multicollinearity

Table A presents the results of the multicollinearity test using the Variance Inflation Factor (VIF). According to the decision criterion, variables with VIF values exceeding 10 indicate high multicollinearity and should be excluded from the model. The results in Table 2 show that all variables have VIF values well below this threshold, with a mean VIF of 2.981. Therefore, multicollinearity is not a concern in this model.

Table A. VIF Test Results

	VIF	1/VIF
lnGDPPC	5.341	.187
lnCPI	2.722	.367
lnVoice	2.05	.488
lnInflation	1.811	.552
Mean VIF	2.981	.