Interrogating the Inflation-Corruption nexus for developing countries: The case of Ghana

by

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Abstract

This paper examined the corruption-inflation nexus for Ghana using the Bounds Test for cointegration and the NARDL-ECM model. Results confirm cointegration in the presence and absence of asymmetry. There is asymmetry in the magnitude response of inflation to corruption in the long run, but the same cannot be said of the short run. In the long run, when lagged inflation increases by a unit, corruption increases by 0.028. When the lag of inflation decreases by a unit, corruption falls by 0.021. The Wald test confirms the difference is statistically significant. In comparison, the exchange rate has no asymmetric relationship with corruption in the long run. Asymmetry cannot be confirmed in the short run for both inflation and the exchange rate. A VAR model was estimated and compared to NARDL-ECM results because of possible simultaneity bias. VAR results confirmed the positive relationship between inflation and corruption. Granger causality runs from inflation to corruption. The result is consistent with cross-country findings confirming a positive relationship between corruption and inflation, with causality running from inflation to corruption. Since inflation undermines purchasing power, distorts economic planning, and encourages corruption in Ghana, the government must redouble efforts to tackle inflation to reduce corruption.

Key words: Inflation, Corruption, NARDL, Bounds Test, VAR, and Granger Causality

JEL Classification: C10, O55, and E31

CHAPTER 1: INTRODUCTION

Corruption is a global issue and an important challenge that all developing nations grapple with because it leads to the wastage and leakage of resources and makes development difficult for developing countries (**Shabbir & Yaqoob 2019; Shleifer & Vishny, 1993; Mauro 1995**). Corruption is defined as the abuse of public trust for private gain (**Rose Ackerman 1978; World Bank, 1997; Transparency International, 2002**).

Although it is a global problem, corruption is found to be more pervasive in developing countries like Ghana than in developed countries (**Shabir** & **Anwar 2007; Olken** & **Pande, 2011; Turedi** & **Altina 2016**). Corruption has also been found to undermine African development (**Gyimah-Brempong 2002 and Gyimah-Brempong and De Camacho, 2006).**). The United Nations (UN) found that global corruption cost the globe $3.6 trillion in 2018 (**United Nations, 2018**). According to **Zouaoui, Ben Arab,** and **Alamriv (2022**), a 2021 World Bank articles estimated that the cost of corruption is about 25% of gross domestic product (GDP) in the case of African Union (AU) member countries. Corruption is clearly problematic in African countries like Ghana.

Curiously, apart from heightened corruption, economic crisis in Ghana is often always characterized by debilitating inflation. Inflation, defined as the general rise in the price level, undermines the purchasing power of citizens, hits the poor the hardest and gets them to support political uprisings. Previous non-military Ghanaian governments such as the Kwame Nkrumah government (1957-1966), the Kofi Abrefa Busia Administration (1969 to 1972) and the Liman administration (1979-1981) were toppled with the justification of excessive corruption and economic mismanagement characterized by crippling inflation.

Although, legally, the monetary and fiscal authorities are supposed to act independently in Ghana, the reality is that they seldom do. The monetary authorities yield to requests by the fiscal authorities to engage in deficit financing and money printing, making the fight against inflation difficult.

Surprisingly, there is very little literature on the corruption-inflation nexus for a single country case, not just for Africa, but worldwide, despite calls for same in the literature by **Nguyen** and **van Dijk (2012**), **Abu** and **Staniewsky (2019), Ali** and **Isse (2003), Olken** and **Pande (2011),** and **Turedi** and **Altina (2016).** This paper quantifies the nature of the inflation-corruption relationship for the specific case of Ghana using time series techniques that carefully interrogate possible non-stationary, asymmetry, and co-integration relationships. The paper also addresses possible misspecification problems that plague time series estimation, such as endogeneity.

There is no consensus yet in the empirical literature about the complete set of factors influencing corruption. There is, however, firmer cross-country literature evidence that corruption tends to rise with a rise in inflation (**Braun & Di Tella, 2004; Turedi & Altina, 2016**). Empirical work on the corruption-inflation nexus has historically approached the research from mainly a cross-section perspective (**Evrensel, 2010; Akça, et al., 2012; Maria et al., 2021; Turedi & Altina 2016**), often focusing exclusively on developed countries (**Braun and Di Tella 2004**). In recent times, however, some researchers have considered developing countries as a separate entity from developed countries in discussing the corruption-inflation nexus perhaps because both corruption and inflation tend to be much higher for developing countries (**Uroos et al 2022; Zouaoui et al 2022**). We observed that there is established research for only four countries on the corruption-inflation nexus using time series methods. They include **Uroos et al (2022)'s** work on Pakistan; Zouaoui et al (2022)'s research on Tunisia and several papers on Nigeria including work by **Abu** and **Staniewsky (2019**) and **Isiwu** and **Aminu (2018)**. Research on the corruption-inflation nexus for Ghana is extremely rare.

Abo et al (2021) is the only paper we found that investigates the macroeconomic determinants of corruption for Ghana with inflation as a key variable. However, **Abo et al (2021)** neither test for cointegration nor allow for possible asymmetry in testing for cointegration. They also ignored different possible sources of endogeneity in the corruption-inflation regression. We employ the ARDL and NARDL models that include lagged values of both the dependent and independent variables as regressors to account for possible feedback endogeneity. ARDL and NARDL models are preferred to VAR if variables are not integrated of the same order (**Pesaran and Shin 2001).** Following **Pesaran and Shin (2001),** we are also more careful about testing for cointegration given different orders of integration of the variables (I (0) or I (1)). We also allow for possible asymmetric effects in testing for cointegration as directed by **Shin, Yu** and **Greenwood-Nimoh (2014).**

We contribute to literature in five main ways. First, we use the most recent data to contribute to the limited studies on the corruption-inflation nexus for single countries, and for Ghana in particular. Second, we are more careful about the time series properties of the variables we use in the regression since we test for both stationarity and cointegration before performing ARDL and NARDL regressions. Further, since our model is parsimonious, multicollinearity does not emerge as a problem. Third, we are very careful about the cointegration test by allowing for the possibility of different orders of integration of the data and for asymmetric responses of the dependent variable to shocks or perturbations to the independent variables. Fourth, we account for possible simultaneity or endogeneity due to feedback from inflation to corruption and other sources of endogeneity. Finally, we initially employ a very general model that includes variables such as the exchange rate, the inflation rate, the poverty rate, the money supply, the government debt, and oil prices in estimating the corruption-inflation nexus. We then narrowed down to a parsimonious model with inflation, exchange rate, Real GDP per capita, Voice and Accountability, and Rule of Law and their lags as the independent variables by eliminating insignificant variables do not contribute to the model fit.

CHAPTER 2- THE LITERATURE REVIEW

2.1 Theoretical Review of the Literature on Corruption Determinants

Controversy remains in the literature about the very definition of corruption (**Rodham et al, 2022).** Even if we agree with **Rose-Ackerman (1978)** that *"corruption is the abuse of the public trust for private gain*," there is little consensus in the economic literature about a unifying theory that explains the determinants and consequences of corruption. Corruption was initially conceptualized by economists like **Leff (1964), Nye (1967),** and **Huntington (1968)** as a complement to the price allocation mechanism. Corruption just facilitated the efficient allocation of resources to the highest bidder. In order words, corruption facilitated resource allocation and was not a different phenomenon from standard market economics.

An example of the historically positive view of corruption in economics is described by **Leff (1964)** where firms compete for a single government permit to operate, and corruption serves as an auction mechanism whereby the most efficient firm which pays the highest bribe is awarded the permit. In this context, corruption improves allocative efficiency because the lowest cost firm, or the most efficient firm, gets the contract because it can pay the highest bribe (**Leff, 1964**). A second example comes from **Nye (1967).** He describes a situation where developing country governments impose excessive bureaucratic regulations and controls on their economies which create uncertainties for foreign enterprises trying to do business in their countries. Bribery encourages bureaucrats to circumvent the regulations and time-wasting bureaucracy and minimize uncertainty regarding enforcement, speeding up the process. The increased business activity that results from bribe payments may stimulate the development process (**Nye, 1979).**

The positive view of corruption in economics, conceptualized as the "*Grease in the Wheel"* theory of corruption (**Meon 2005 & Antwi et al, 2020**) is also sometimes called the *"Bottleneck Theory of corruption"*. “The Bottleneck Theory” of corruption suggests that bureaucratic inertia impedes efficiency, so corruption paves the way for the removal of the bottlenecks in order that the desired objectives can be achieved faster (J**ohnston, 1996; Powell, Manish, and Nair 2010, & Bardhan, 1997)**. The bottleneck theory is famous in economics corruption literature as the “*Grease in the wheels theory of corruption*" and has been espoused **by Leff (1964), Nye (1967), Huntington (1968), Kaufman** and **Wei (1999),** and **Aidt (2003)** among others.

In sharp contrast to the *"Bottleneck Theory of Corruption"* is the “*Efficiency reducing theory of corruption*” which posit that, corruption increases transaction costs, and has the same effect as a distortionary tax. In effect, given the profit maximization motives of firms, they find more corrupt countries less attractive (**Wei, 1997; Shleifer & Vishny, 1993**). The "*Efficiency Reducing Theory of Corruption"* is infamous in economics of corruption literature as the “*Sand in the Wheels”* theory of corruption and has support in the literature (**Antwi et al 2020; Abo, Hammond and Amissah, 2021; Nsor-Ambala and Coffie 2021**).

Several theories have also emerged to discuss the determinants of corruption. For example, according to **Ades** and **Di Tella (1997),** and **Braun** and **Di Tella (2004)** there are **three main flavors** of theories that try to explain why corruption occurs although their links to the main empirical economic determinants of corruption like income, inflation, unemployment, poverty, trade openness, education, and exchange rate depreciation as well as institutional determinants like rule of law, property rights, and ease of doing business are tenuous at best. The three theories explaining the determinants of corruption are the (i) **Compensation Theory of corruption** (often referred to as the Businessman’s Approach to corruption), (ii) **Competition Theory of Corruption** (or the Economist Approach to corruption) and (iii) **Incentive Theory of Corruption** (or the Lawyer’s Approach to corruption).

The Compensation Theory of Corruption due to **Becker & Stigler (1974),** among others, proposes that corruption is more likely among the poor and low-income earners. When government bureaucrats in low-income countries, vested with discretion about whether to provide a government good or service, have relatively low incomes, even if the incomes reflect their marginal product, corruption will likely occur (**Becker Stigler, 1974; Schleifer & Vishny, 1993**). This is because some officials can look the other way instead of rigidly enforcing the law after accepting a bribe. Following the efficiency wages argument of **Becker (1968)** and **Rose-Ackerman (1978)** among others, paying a higher income (maybe more than marginal product) will reduce the incentive of the bureaucrat to engage in corruption in a Principal-Agent model where the agent is supposed to enforce the rules on behalf of, and in the absence of, the principal, in this case the government.

The Incentives Theory of Corruption or “The Control Approach” or the Lawyers approach of Italy’s Judge, **Antonio Di Pietro (1994)**, consists of producing tougher new laws and tougher enforcement of existing laws to mitigate corruption (**Abu** and **Staniewsky, 2019**). The Incentive Theory involves a combination of rewards and punishments to de-incentivize corrupt behavior (**Abu** and **Staniewsky 2019**). It is rooted in the economics of strong institutions. According to **Abu** and **Staniewsky (2019),** the third theory of corruption, the **Competition Theory of corruption** or the Economist’s approach due to **Rose-Ackerman (1978), Ades and Di Tella (1997) and Bliss and Di Tella (1997)** involves increasing competition among government bureaucrats with discretionary power to provide or refuse the provision of government services or products**.** The intuition behind this approach is that there is lack of competition among bureaucrats for the provision of a public service which may give them the monopoly power to demand bribes because they have discretion due to low monitoring and the absence of competition.

2.2 Theoretical Review of the Inflation-Corruption Nexus

An important theory linking inflation and corruption is the Information Theory of Corruption (**Braun** and **Di Tella 2004)**. According to the Information Theory of Corruption, agents are incentivized to act corruptly due to problems in the transmission of information, such as difficulties in carrying out price comparisons. In a simple agency setting, these problems make it more costly for a principal to control an agent that must report a price (**Braun** and **Di Tella 2004**). The agent's actions, including possible corrupt mispricing will likely go undetected and or unpunished. High variability in prices and elevated inflation can make over-invoicing by procurement officers and under-invoicing by sales-persons easier because it makes auditing more expensive to the principal (**Braun** & **Di Tella 2004**). In this context inflation is a determinant of corruption or inflation promotes corruption.

2.3 Empirical Review of the Corruption-Inflation Nexus: A Cross-Country Perspective

The existing literature focuses on cross-country estimation of the corruption-inflation nexus with very limited research on single country, time series estimation of the corruption inflation nexus. The available cross-country analysis considered both developed and developing countries together (**Al-Marhubi 2000**; **Braun & Di Tella**, **2004; Ayodeji, 2020; & Sha & Aish, 2022**).

Braun and **Di Tella (2004)** investigated the relationship between corruption and inflation variability in 75 developed and developing countries. They document a significant and positive relationship between corruption and inflation variability. They used Two-Stage Least Square (2SLS) estimation, a variant of the Instrumental Variable (IV) estimation which has the potency to control for feedback effect or endogeneity due to simultaneity.

Using panel, fixed effects, and data for 2002-2010 on 97 countries, **Akca et al (2012)** investigated the effect of inflation on corruption. After controlling the effects of relevant institutional and economic variables, they found that inflation positively impacts corruption, irrespective of the income group.

Turedi and **Altiner (2016)** studied the economic and political factors affecting corruption in developing countries. They used the panel fixed effects estimation technique with data ranging from 2002-2012 in 56 countries and performed all relevant diagnostic tests. While all other variables in their model reduce corruption, they document that inflation significantly promotes corruption.

Sha and **Aish (2021**) examined the relationship between corruption, inflation, and money laundering using panel data for five Asian countries over a seven-year period (2013-2019). They used both the panel fixed effects and random effects methods and checked for robustness using the generalized methods of moments (GMM) estimator. They document a significant positive relationship between corruption and inflation.

The empirical literature considers mainly developed countries and finds mixed results in terms of the direction of causality of the relationship between inflation and corruption. Time series analysis of the corruption-inflation nexus that accommodates for possible non-stationarity, different orders of integration, possible cointegration and potential asymmetry in the response of the dependent to the explanatory variables is scant for developing countries like Ghana. This research fills the existing literature gap.

CHAPTER 3: METHODS

3.1 Model Specification

We employed the ARDL model due to **Pesaran, Shin and Smith (2001)** that allows for variables to be integrated of different orders and the Nonlinear ARDL (NARDL) or the Asymmetric ARDL model due to **Shin, Yu and Greenwood-Nimoh (2014)** in the analysis**.** The latter allows for non-symmetric responses of a dependent variable to changes in the explanatory variable. The NARDL is flexible and captures possible nonlinear effects in testing for cointegration among variables integrated of different orders. The (N) ARDL typically uses first-differences and lags of the dependent and independent variables and is unlikely (in the absence of serial correlation) to suffer feedback endogeneity due to correlations between the error term and the RHS variables. We specify the initial basic OLS model for corruption as follows before extending it to the ARDL and NARDL:

$$Corruption_t = Inflation_t + RGDP_t + Voice\&Accountability_t + RuleOfLaw_t + ExcRate + \varepsilon_t$$

(1) and

(2) $\varepsilon_t \sim N(0, \delta^2)$

where the errors (ε_t) are identically, independently, and normally distributed random errors with zero mean and constant variance (δ^2). We elaborate how we arrive at the NARDL model and specify the full NARDL model in the context of the Bounds Test in subsequent sections that deal with the empirical approach to estimation.

In (1), $Corruption_t$ refers to either the control of corruption (COC) index or the corruption perceptions index (CPI) in the current period because we estimate (1) using each of COC and CPI in turn as the dependent variable and compare the results. $RGDP_t$ is the real gross domestic product to proxy income level. The institutional variables include $Voice\&Accountability_t$ or the voice and accountability index, as well as RuleOfLaw which measured the degree to which democracy is practiced in Ghana over time. Finally, ExcRate is the Exchange Rate. The error term is represented by ε_t.

3. 2 Variable Description and Justification of Choice of Variables

There are a few well-known indices of corruption in literature. The most popular indices of corruption measure the perception of corruption instead of corruption because it is difficult to measure corruption which is an act that often happens covertly as a matter of necessity. The well-known corruption perception measures include the ***corruption perception index*** (CPI), ***control of corruption*** (COC) and the International Country Risk Guide's (ICRG)'s corruption index. However, some authors, such as **Torrez (2002)** have cautioned researchers about using the International Country Risk Guide's corruption index, arguing that it is limited in its range and may produce results different from other corruption indices.

Both the COC and the CPI measure how well corruption is being controlled and not the level of corruption. The COC has a range of -2.5 (most corrupt) to 2.5 (least corrupt) so an increase in COC rather indicates a decline in corruption and a decline in the COC represents an increase in corruption. In comparison, the CPI has a range of 0 (most corrupt) to 100 (least corrupt) so like the COC an increase in the CPI is associated with a decline in corruption and a decline in the CPI is associated with an increase in corruption. This means a positive sign on the coefficient of a determinant of corruption using these two indicators rather means that corruption decreases as the determinant increases and vice versa. For example, a negative coefficient on the inflation variable in the corruption-inflation regression means inflation has a positive relationship with corruption.

The corruption perceptions index (CPI) data used in this study was obtained from Transparency International's (TI's) website. The data according to TI is reported on 198 countries every year and the same countries are ranked every year in addition to reporting their corruption scores. The index is calculated based on surveys from 13 sources. For reliability checks, countries that have less than three sources of corruption data are excluded. Since the 13 different sources use different methodologies to arrive at their indices, TI first standardizes the data, then computes the average of all the different indices. The data has been reported since 1995 though data on most countries only became available after 1995. According to the TI, in 2012, they completely changed the methodology of the CPI, which includes modifying the range to span 1 to 100 instead of 1 to 10. Due to this major methodological change, the data between 1995-2011 may be incomparable to the data between 2012-2020. Therefore, results using the CPI must be interpreted with care. This concern about the reliability of the CPI data is one key reason why we are using the COC as the dependent variable in the corruption equation for comparison with the CPI results.

The control of corruption (COC) data came from the World Governance Indicators (WGI), a World Bank Project database. The index is reported along with other governance indicators such as the government effectiveness, regulatory quality, and the rule of law. The WGI reports data on about 200 countries and territories over the period 1996-2020. The index is computed based on 30 individual corruption sources. The data from the individual corruption sources are first rescaled to range from 0 to 1. The indices are made comparable across the different sources by rescaling the 0 to 1 scaled data to run from -2.5 (most corrupt) to 2.5 (least corrupt). The final index is the weighted average of the indices from different sources. The COC index is our main corruption variable; CPI is used for comparison.

The **regulatory quality, rule of law, government effectiveness and voice and accountability** were all sourced from the World Governance Indicators website. These indices range from -2.5 (most corrupt) to 2.5 9least corrupt). These governance indicators help to determine the effect of institutional and political factors on corruption. All other things being equal, higher government effectiveness, higher rule of law, higher voice and accountability and higher regulatory quality should lead to a decline in the level of corruption **(Rose-Ackerman 1999; Alesina et al, 1992** and **Compante et al,** ***2009***).

***Real GDP* and Corruption.** A negative relationship is expected between *Real GDP* and Corruption from a theoretical perspective. Real GDP is used as a proxy for average income and economic development. Real GDP is known to be negatively associated with corruption as available historical data shows wealthier countries are less corrupt than poor countries. Corruption tends to diminish as a country gets wealthier and advances economically. This may be because economically advanced (rich) countries build strong institutions that promote quality governance and reduce corruption (**Paldam 2001 & Treisman, 2000).** It may also be the case that wealthier countries pay higher wages to workers who are then less corruptible because such workers either do not need the bribe money or consider the pain of losing their job if detected and fired for corruption too high to bother with corruption. However, it is also plausible that high levels of corruption can reduce growth (**Antwi et al., 2020**) and exacerbate poverty (**Gyimah-Brempong 2002**). Further, **Ang (2020)** has demonstrated in her work on China that a specific type of corruption she calls access money can increase instead of reduce growth. This implies that GDP and corruption may be determined simultaneously so that the sign of the income and corruption relationship may be an empirical question. We include lagged Real GDP and rely on econometric techniques to control this possible source of feedback endogeneity. Following the extant literature, we expect a negative relationship between corruption and real GDP as the measure of income.

Exchange Rate and Corruption. In import-dependent developing countries like Ghana, variation in the exchange rate (ER), especially ER depreciation makes imports expensive and provide incentives for monetary and fiscal authorities to engage in corrupt behavior. This is because government employees could generate corrupt rents in the forex markets as secret participants with superior information about government expenditure, inflation and the demand and supply of dollars in Ghana. Government officials and business associates with political connections likely have superior information about the timing of increases in supply of dollars from government coffers and consequently about the timing of depreciation or appreciation of the Cedi so they can benefit from arbitrage opportunities and speculation. In this case, the corrupt behavior also influences exchange rate movements. However, the realization that they can generate corrupt rents can also entice government officials to behave in a corrupt manner. Clearly, although exchange rate differentials can lead to corruption, corruption can also lead to exchange rate differentials so the sign of the relationship between the exchange rate and corruption is an empirical question. We use the lag of exchange rate as an explanatory variable in this analysis to reduce simultaneity bias. Still, a depreciating currency from the previous period can increase inflation and exacerbate poverty creating positive incentives for corrupt behavior so we expect the lagged ER and corruption to be positively corelated.

Inflation and Corruption. According to **Akca et al (2012**), high levels of inflation erode the purchasing power of government officials and public servants who are then incentivized to commit acts of corruption to survive or maintain their standard of living. This kind of corruption can manifest in areas such as police officers collecting bribes or over invoicing or under invoicing by procurement officers or the bypass of the entire procurement process by the political elite and public servants such as officials at the port and government ministries. Inflation is typically found in cross-country empirical work to be positively correlated to corruption.

The economic indicator variables included in this model, namely, real GDP, inflation, and exchange rate were all obtained from the World Bank's open data catalogue.

3.3 Econometrics Approach

To estimate the relationship between inflation and corruption, we first employ the ARDL Bounds test due to **Pesaran, Shin and Smith (2001)** following **Abu and Staniewsky (2019)** and **Antwi et al (2020)**. Next, we executed the NARDL Bounds test due to **Shin, Yu and Greenwood-Nimoh (2014)**. We realized that although the CPI variable was integrated of a different order than the rest of the variables, the COC was integrated of the same order as the RHS variables. Therefore, to minimize the possible bias due to simultaneity, we also estimated VAR to validate the results of the ARDL for the COC regression where all variables are stationary. The VAR is a system approach that specifies all variables as endogenous in the system and clearly makes sense in this model where inflation, and other economic variables as well as the different measures of institutional quality all appear to be ex ante, endogenous in the system. For the CPI equation, since the variables are integrated of different orders, we initially rely on ARDL analysis and supplement it with NARDL analysis.

The ARDL approach is adopted due to several advantages outlined in **Pesaran, Shin** and **Smith (2001)** and reproduced below:

- The ARDL approach is efficient in small samples and our sample size is small.

- The ARDL model is suitable when the variables are either cointegrated of the same order or cointegrated of different orders. However, second order cointegration is not allowed in ARDL analysis (**Pesaran**, **Shin & Smith 2001; Antwi et al, 2020)**.
- The empirical literature has found that there is simultaneity between inflation and corruption (**Braun** & **Di Tella, 2004**). This calls for an estimation approach robust to such simultaneity. Obvious estimation techniques for addressing the simultaneity are VAR models, simultaneous equation models, and Instrumental Variable or 2SLS regression although appropriate instruments are difficult to find.
- The argument has been made in the extant literature that although the single equation ARDL model is not intended to address simultaneity, it has the potential to correct the endogeneity due to simultaneity if the errors are serially uncorrelated because it the ARDL uses lags and first differences of the explanatory variables instead of contemporaneous variables, so it side-steps the relevant simultaneity endogeneity problem.
    - The more general VAR systems approach is also well suited for dealing with simultaneity and endogeneity. The difference is that VAR is a multiple equation approach where all variables are assumed to be endogenous and must be integrated of the same order. In comparison, the ARDL is a single equation approach that accommodates integration of different orders and can side-step the relevant simultaneity endogeneity problem.
    - We focus on ARDL and NARDL as the consensus models because they can handle integration of different orders, are efficient in small samples and can potentially side-step the simultaneity endogeneity problem.
    - The compact ARDL Model is specified as (2) below:

$$\boldsymbol{Y_t = \beta_0 + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{i=0}^{q} \delta_i X_{t-i}} + \varepsilon_t \tag{2}$$

Where, $\boldsymbol{\beta_0}$ a constant**;** $\boldsymbol{Y_{t-i}}$ refers to the lags of the dependent variable with corresponding coefficients $\boldsymbol{\beta_i}$**;** $\boldsymbol{X_{t-i}}$ refers to the lags of the independent variables with corresponding coefficients δ_i. *p* and *q* are the lag lengths of dependent and the independent variables respectively which will be determined by AKAIKE (AIC) optimal lag selection criteria. The ARDL we employ is specified as below:

$$\begin{aligned} &\boldsymbol{Corruption_t = a_0 + \textstyle\sum_{i=1}^{p} \alpha_i\, Corruption_{t-1} + \beta_1 Inflation_t + \beta_2 RGDP_t +} \\ &\boldsymbol{\beta_3 ExchRate_t + \beta_4 VoiceAndAccountability_t + \beta_5 RuleOfLaw_t +} \\ &\boldsymbol{\textstyle\sum_{i=1}^{p} \delta_{1i} Inflation_{t-i} + \textstyle\sum_{i=0}^{q} \delta_{2i}\, RGDP_{t-i} + \textstyle\sum_{i=0}^{q} \delta_{3i}\, ExchRate_{t-i} +} \\ &\boldsymbol{\textstyle\sum_{i=0}^{q} \delta_{4i}\, VoiceAndAccountability_{t-i} + \textstyle\sum_{i=0}^{q} \delta_{5i}\, RuleOfLaw_{t-i}} + \varepsilon_t \end{aligned} \tag{3}$$

Where, $\boldsymbol{Corruption_{t-1}}$ is the lag of the dependent variable **;** $\boldsymbol{Inflation_t}$**,** $\boldsymbol{RGDP_t}$**,** $\boldsymbol{VoiceAndAccountability_t}$**, and** $\boldsymbol{RuleOfLaw_t}$ are the contemporaneous independent variables with their coefficients $\boldsymbol{\beta_1}$-$\boldsymbol{\beta_5}$. $\boldsymbol{Inflation_{t-i}}$, $\boldsymbol{RGDP_{t-i}}$, $\boldsymbol{ExchRate_{t-i}}$, $\boldsymbol{VoiceAndAccountability_{t-i}}$, and $\boldsymbol{RuleOfLaw_{t-i}}$ are the lags of the independent variables with their coefficients $\boldsymbol{\delta_1}$-$\boldsymbol{\delta_1}$. $\boldsymbol{p}$ and $\boldsymbol{q}$ are the lag lengths of the dependent and the independent variables, respectively.

To test for cointegration among the variables, we specify the following ARDL Bounds test equation (4):

$$\Delta Corruption_t = \delta_0 + \sum_{i=1}^{p} \delta_{1i}\, \Delta Corruption_{t-1} + \sum_{i=1}^{p} \delta_{2i} \Delta Inflation_{t-i} + \sum_{i=0}^{q} \delta_{3i}\, \Delta RGDP_{t-1} + \sum_{i=0}^{q} \delta_{4i}\, \Delta ExchRate_{t-i} + \sum_{i=0}^{q} \delta_{5i}\, \Delta VoiceAndAccountability_{t-i} + \sum_{i=0}^{q} \delta_{6i}\, \Delta RuleOfLaw_{t-i} + \beta_1 Corruption_{t-i} + +\beta_2 Inflation_{t-i} + \beta_3 RGDP_{t-i} + \beta_4\, ExchRate_{t-i} + \beta_5\, VoiceAndAccountability_{t-i} + \beta_6\, RuleOfLaw_{t-i} + \varepsilon_t \quad (4)$$

Where, $\Delta Corruption_t$, $\Delta Inflation_t$, $\Delta RGDP_t$, $\Delta ExhRate_t$, $\Delta VoiceAndAccountability_t$, and $\Delta RuleOfLaw_t$, are the short run components, with their coefficients δ_1-δ_6 **and** Δ is the typical difference with respect to time of variables.

$Corruption_t$, $Inflation_t$, $RGDP_t$, $ExchangeRate_t$, $VoiceAndAccountability_t$, **and** $RuleOfLaw_t$ are the long run components with their coefficients, β_1-β_6.

We test the hypothesis:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0 \quad (5)$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0 \quad (6)$$

After establishing cointegration, we estimate an ARDL error correction model as follows to investigate the short dynamics (7):

$$\Delta Corruption_t = \delta_0 + \sum_{i=1}^{p} \delta_{1i}\, \Delta Corruption_{t-1} + \sum_{i=1}^{p} \delta_{2i} \Delta Inflation_{t-i} + \sum_{i=0}^{q} \delta_{3i}\, \Delta RGDP_{t-1} + \sum_{i=0}^{q} \delta_{4i}\, \Delta BroadMoney_{t-i} + \sum_{i=0}^{q} \delta_{5i}\, \Delta VoiceAndAccountability_{t-i} + \sum_{i=0}^{q} \delta_{6i}\, \Delta RuleOfLaw_{t-i} + \varphi ECT_{t-1} + \varepsilon_t \quad (7)$$

Where everything in (7) is explained as above, except ECT_t, the error correction term, which is the lagged residuals of the long run model. φ is the coefficient of the error correction term, indicating the speed of adjustment to long run equilibrium.

The traditional ARDL assumes that there is symmetric effect of the independent variable on the dependent variable. Applied to this context, the magnitude of the effect of increasing inflation on corruption will be identical to the magnitude of the effect of decreasing inflation on corruption with the only difference being the sign. However, that might not be the case, as the relationship might be asymmetric so requiring the application of the Non-Linear ARDL approach (**Shin, Yu and Greenwood-Nimoh, 2014**). Taking this possibility of asymmetry into account, we estimate the Nonlinear ARDL Bounds test with the model specified below (8):

$$\begin{aligned}
\Delta Corruption_t &= \delta_0 + \sum_{i=1}^{p} \delta_{1i}\, \Delta Corruption_{t-1} \\
&+ \sum_{i=1}^{p} \delta_{2i}^{+} \Delta Inflation^{+}{}_{t-i} + \sum_{i=1}^{p} \delta_{3i}^{-} \Delta Inflation^{-}{}_{t-i} + \sum_{i=0}^{q} \delta_{4i}^{+}\, \Delta RGDP^{+}{}_{t-1} \\
&+ \sum_{i=0}^{q} \delta_{5i}^{-}\, \Delta RGDP^{-}{}_{t-1} + \sum_{i=0}^{q} \delta_{6i}^{+}\, \Delta BroadMoney^{+}{}_{t-i} \\
&+ \sum_{i=0}^{q} \delta_{7i}^{-}\, \Delta BroadMoney^{-}{}_{t-i} + \sum_{i=0}^{q} \delta_{8i}^{+}\, \Delta VoiceAndAccountability^{+}{}_{t-i} \\
&+ \sum_{i=0}^{q} \delta_{9i}^{-}\, \Delta VoiceAndAccountability^{-}{}_{t-i} + \sum_{i=0}^{q} \delta_{10i}^{+}\, \Delta RuleOfLaw^{+}{}_{t-i} \\
&+ \sum_{i=0}^{q} \delta_{11i}^{-}\, \Delta RuleOfLaw^{-}{}_{t-i} + \rho_1 Corruption_{t-i} + \beta_2^{+} Inflation^{+}{}_{t-i} \\
&+ \beta_3^{-} Inflation^{-}{}_{t-i} + \beta_4^{+} RGDP^{+}{}_{t-i} + \beta_5^{-} RGDP^{-}{}_{t-i} \\
&+ \beta_6^{+} BroadMoney^{+}{}_{t-i} + \beta_7^{-} BroadMoney^{-}{}_{t-i} \\
&+ \beta_8^{+} VoiceAndAccountability^{+}{}_{t-i} \\
&+ \beta_9^{-} VoiceAndAccountability^{-}{}_{t-i} + \beta_{10}^{+} RuleOfLaw^{+}{}_{t-i} \\
&+ \beta_{11}^{-} RuleOfLaw^{-}{}_{t-i} + \varepsilon_t
\end{aligned} \tag{8}$$

Where, $\sum_{i=0}^{q} \delta_i^{+}$ and $\sum_{i=0}^{q} \delta_i^{-}$ denote the short run response to a positive change in X_i and negative change in X_i, respectively; $\frac{-\beta_i^{+}}{\rho}$ **and** $\frac{-\beta_i^{-}}{\rho}$ are the long run positive and negative asymmetric effects of X_i $(the\ \boldsymbol{\beta i})$ on corruption scaled by the coefficient on the lagged dependent variable $\boldsymbol{\rho}$.

Following **Shin-Yu and Greenwood-Nimoh (2014)**, to test for the cointegration in the context of long run asymmetric response, we test the following hypothesis (9):

$$H_0: \boldsymbol{\rho} = \boldsymbol{\beta}^{+} = \boldsymbol{\beta}^{-} = \mathbf{0} \tag{9}$$

If we reject H_0, then we conclude that, the variables are cointegrated in the presence of asymmetry. Once long run asymmetric cointegration is established, we proceed to jointly test the significance of the asymmetric coefficients as shown in below (10):

$$\mathbf{H_0} = \frac{-\beta_i^{+}}{\rho} = \frac{-\beta_i^{-}}{\rho} \tag{10}$$

If H_0 is rejected, we conclude that there is a significant long-run asymmetric effect.

3.4 Descriptive Statistics

Table 1 contains descriptive statistics for all the variables used in this analysis. The number of observations in each variable is 23; hence, our annual time series data comprises the 23-year period from 1998 to 2020. The average value of the COC index for Ghana is -0.141, an indication of poor corruption control in the country overall since the minimum is -2.5 (worst corruption) and the maximum is 2.5 (least corruption). Over the period under review, the highest corruption control score Ghana achieved was 0.039, which is far away from the highest score possible of 2.5.

Table 1
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
COC	23	-.141	.107	-.367	.039
CPI	23	39.13	4.713	33	48
Inflation	23	15.723	9.487	4.865	41.509
RGDP	23	3.302e+10	2.364e+10	4.983e+09	6.853e+10
BroadMoney	23	2.718e+10	3.435e+10	3.953e+08	1.208e+11
Voice&Accountability	23	.387	.206	-.187	.598
RuleOfLaw	23	.015	.098	-.276	.155

In comparison, the CPI also offers similar insight as the COC. Ghana's average corruption perception index was 39.13. Ghana's highest CPI score was 48, less than half of the total possible score of 100 which indicates no corruption. While Ghana scores low on corruption control, it records a high inflation rate. It records a 15.7% inflation on average and a figure as high as 41.5% being the maximum score over the period.

CHAPTER 4: RESULTS

4.1 Unit Root Test Result

One issue often encountered in using time series data for regression is the existence of unit roots. In the presence of non-stationarity (unit root), regression produces misleading results (**Wooldridge, 2009**). In particular, to run an ARDL test, one condition necessary is that the series must be I(0) or I(1), but never I(2). To ensure this condition is met, we ran the Augmented Dickey-Fuller (ADF) test to test the following hypothesis:

H_0: The time series process is not stationary

H_1: The time series process is stationary.

From Table 2, COC and Inflation variables are all level stationary (I (0)) by the Augmented Dickey Fuller (ADF) test. Exchange Rate, Rule of Law, and Accountability are all first difference stationary I(1)).

Table 2
Results of Augmented Dickey-Fuller (ADF) Unit Root Test for Stationarity

Variable	Drift	Stationarity Conclusion
COC(Level)	-2.334 (-1.734)	I(0)
CPI(Level)	-1.404 (-1.734)	I(1)
1st Difference	-2.956 (-1.740)	
Inflation (Level)	--3.228 (-1.761)	I(0)
RGDP(Level)	0.021 (-1.734)	I(1)
1st Difference	-5.155 (-1.729)	
ODA (Level)	-1.994 (-1.734)	I(0)
Trade Openness (level)	-1.944 (-1.734)	I(0)
Borrowing (level)	1.542 (-1.734)	
1st difference	-0.853 (-1.740)	I(2)
2nd difference	-2.612 (-1.746)	
Broad Money Supply	2.197 (-1.734)	I(0)
FDI (level)	-1.134 (-1.734)	
1st difference	-2.472 (-1.740)	I(1)
Government Effectiveness (level)	-2.425 (-1.734)	I(0)
Exchange Rate (level)	1.463	

4.2 ARDL Results

The results from estimating the ARDL model using the Control of Corruption (COC) variable as the main dependent variable is displayed in Table 3. The coefficient of inflation as well as its first and second lags are negative, and the results are statistically significant. However, the COC variable is a measure of control of corruption, and not corruption itself. Hence, an improvement in control of corruption means a decline in corruption. So, a negative relationship between control of corruption and inflation implies a positive relationship between inflation and corruption. Therefore, an increase in inflation increases corruption in Ghana. Likewise, past inflation also induces corruption. Hence, as expected, although the model shows a negative relationship between inflation and corruption control, the correct interpretation of the negative coefficient of the inflation is that there is a statistically positive relationship between inflation and corruption in Ghana.

The regression using Corruption Perceptions Index (CPI) instead of Control of Corruption (COC) as the measure of corruption, however, shows slightly different results. From Table 4, while current inflation shows a positive relationship with corruption, the result is insignificant. Likewise, the lag of inflation has a negative relationship with corruption, but not significant at the 5% level.

Table 3

ARDL (1, 2, 2, 2,2,2) Estimation Results with COC as the Dependent Variable

Variable	COC Dependent
L.COC	-0.168
	(0.079)
Inflation	-0.010***
	(0.001)
L.Inflation	-0.012***
	(0.002)
L2.Inflation	-0.008***
	(0.001)
RGDP	2.83e-11***
	(3.84e-12)
L.RGDP	-4.66e-11***
	(5.04e-12)
L2.RGDP	-4.58e-11***
	(7.13e-12)
ExchRate	1.818***
	(0.196)
L.ExchRate	-0.370**
	(0.122)
L2.ExchRate	-1.116***
	(0.166)
VoiceAndAccountability	0.277**
	(0.072)
L.VoiceAndAccountability	1.499***
	(0.164)
L2.VoiceAndAccountability	1.074***
	(0.127)
RuleOfLaw	-0.827***
	(0.176)
L.RuleOfLaw	-0.014
	(0.130)
L2.RuleOfLaw	-1.031***
	(0.112)
Constant	-0.263**
	(0.073)
Observations	21
R-squared	0.995

Note: *Standard errors are in parentheses. *** indicates significance at 0.01 level, ** indicates significance at 0.05 level and *indicates significance at 0.1 level of significance*

The exchange rate has a positive relationship with control of corruption implying that as the exchange rate goes up, corruption goes down. Since a depreciating currency promotes exports, and increasing exports promotes growth in income, and growth in income in turn reduces corruption, this result is not totally unexpected as it shows that corruption goes down as the Ghana cedi loses value. The result is the opposite with the corruption perception index. It shows that, as exchange rate rises, corruption rises as well, consistent with literature. The lags of exchange rate, however, are positively related to corruption in both models, except the first lag of CPI.

Table 4

ARDL (1,1,1,2,1,1) Estimation Results with CPI as the Dependent Variable

VARIABLES	CPI Dependent
L.CPI	0.014
	(0.131)
Inflation	-0.038
	(0.043)
L.Inflation	0.068*
	(0.036)
RGDP	3.31e-11
	(1.02e-1)
L.RGDP	4.39e-1**
	(1.46e-1)
ExchRate	-5.136
	(4.133)
L.ExchRate	8.431**
	(3.699)
L2.ExchRate	-7.691***
	(1.852)
VoiceAndAccountability	-10.554***
	(2.590)
RuleOfLaw	-0.143
	(5.086)
Constant	35.585***
	(4.615)
Observations	21
R-squared	0.969

Note: *Standard errors are in parentheses. *** indicates significance at 0.01 level, ** indicates significance at 0.05 level and *indicates significance at 0.1level of significance*

4.2.1 ARDL Bounds Test of Cointegration Results

To investigate the short-run and long-run dynamics of the relationship between the variables, we conducted an ARDL Bounds test of cointegration. Following **Pesaran, Shin and Smith (2001)**, the criterion used is that we reject the null hypothesis of no cointegration if the F-Statistic is greater than the upper bounds of a chosen level. As Table 5 shows, the F-statistic obtained, 32, is greater than 4.68 which is the upper bound for the 1% significance level, so the F-Statistic is greater than the upper bounds. Hence, we conclude that the variables are cointegrated, justifying the use of an Error Correction Model (ECM). We thus investigate the short and long-run dynamics of the model by estimating the ARDL-ECM.

Table 5

ARDL Bounds Test Critical Values for Upper and Lower Bounds

K	95% Confidence Level		99% Confidence Level		F(w)-Statistic
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	
5	2.62	3.79	*3.41*	*4.68*	32.046

Note: The null hypothesis of no cointegration is rejected if the F-statistic is >the upper bound(I_1) for the relevant significance level (α)

4.2.2 ARDL Error Correction Results (ARDL-ECM)

The ARDL-ECM model allows us to separate the effect of inflation on corruption in the short run and the long run. From Table 6 below, in the short run, there is a positive relationship between inflation and control of corruption. In other words, as inflation rises by one unit in the short run, corruption decreases by 0.019 units. However, the result is the opposite in the long run. An increase in Inflation results in a significant increase in corruption.

The exchange rate, in both the short run and long run, has a positive relationship with the control of corruption (see Table 6). Hence, as the exchange rate increases, corruption decreases in both the short and long run. In the short run, there is a positive relationship between RGDP or income and control of corruption, implying that income has a negative relationship with corruption. In the long run, however, an increase in RGDP will lead to a rise in corruption. Voice Accountability and its lag have positive effect on corruption in the short run. But in the long run, a negative effect is observed. Although Rule of Law is negatively related to corruption in the short run, the relationship is positive in the long run.

Table 6

ARDL Error Correction Results with COC as the Dependent Variable

VARIABLES	COC Dependent		
D.Inflation			0.019***
			(0.003)
LD.Inflation			0.008***
			(0.001)
D.RGDP			9.23e-11***
			(1.03e-11)
LD.RGDP			4.58e-11***
			(7.13e-12)
D.ExchRate			1.486***
			(0.161)
LD.ExchRate			1.116***
			(0.166)
D.VoiceAndAccountability			-2.573***
			(0.281)
LD.VoiceAndAccountability			-1.074***
			(0.127)
D.RuleOfLaw			1.045***
			(0.146)
LD.RuleOfLaw			1.031***
			(0.112)
Inflation		-0.025***	
		(0.003)	
RGDP		-5.48e-11***	
		(5.93e-12)	
ExchRate		0.284***	
		(0.036)	
VoiceAndAccountability		2.440***	
		(0.190)	
RuleOfLaw		-1.603***	
		(0.229)	
ECT	-1.168***		
	(0.079)		
Constant			-0.263**
			(0.073)
Observations	21	21	21
R-squared	0.995	0.995	0.995

Note: *Standard errors are in parentheses. *** indicates significance at 0.01 level, ** indicates significance at 0.05 level and *indicates significance at 0.1level of significance*

The CPI measure of corruption produces an opposite result in comparison to the COC measure of corruption. From Table 7, in the short run, an increase in inflation leads to a rise in corruption of 0.119 because CPI falls by 0.119. In the long run, the result is insignificant. The result generated by the COC, our model of focus, is as expected and more consistent with the literature that corruption is more rampant in an inflationary environment (see for example **Braun & di Tella, 2004**).

Table 7

ARDL Error Correction Results with CPI as the Dependent Variable

VARIABLES	CPI Dependent		
Inflation		0.107469 (0.074201)	
RGDP		6.90e-1*** (9.98e-11)	
ExchRate		-5.646066*** (0.933016)	
VoiceAndAccountability		-12.806223*** (3.841684)	
RuleOfLaw		4.479983 (6.203717)	
ECT	-0.885782*** (0.130882)		
D.Inflation			-0.119011*** (0.036633)
D.RGDP			-7.09e-1*** (1.62e-10)
LD.RGDP			-2.54e-1*** (7.14e-11)
D.ExchRate			-4.618154 (4.036930)
Constant			31.524998*** (4.491023)
Observations	21	21	21
R-squared	0.912391	0.912391	0.912391

Note: Standard errors are in parentheses. *** indicates significance at 0.01 level, ** indicates significance at 0.05 level and *indicates significance at 0.1level of significance

4.3. Diagnostic Tests

One of the advantages of using the ARDL Bounds test approach is its robustness in the presence of the usual time series issues such as autocorrelation. The ARDL model, according to **Pesaran and Shin (1999)** has been developed to take care of the autocorrelation problem. Hence, we ignore autocorrelation and focus on the homoscedasticity test. We performed the White's homoscedasticity test with the following null hypothesis:

H_0: Homoscedasticity

From Table 8, with a probability value of 0.65, we fail to reject the hypothesis of homoscedasticity. So, we conclude that heteroscedasticity is not a problem in this regression.

The model is also well-fitted because, in both the ARDL and the ARDL Bounds ECM models, about 98.5% of the variation in corruption is explained. As Figure 2 shows, we also see that the model falls within the 55 percent band, hence, the model is stable.

Table 8

Diagnostic Tests (Autocorrelation and Heteroscedasticity) Test Result for ARDL ECM with COC as the Dependent

Variable

Test	chi2	Probability
Breusch-Godfrey LM test for autocorrelation	18.698	0.0001
White's test for Homoscedasticity	21.00	0.6516

4.4. Vector Autocorrelation and Granger Causality Results

To account for possible simultaneity (feedback effect between our two variables of interest, corruption, and inflation), we run a simple VAR test with only inflation and Control of Corruption (COC) as our endogenous variables since they are both level stationary. The results are shown in Table 9. It shows that Inflation is negatively and significantly related to the control of corruption (COC). Hence, as inflation increases, corruption also increases, just as the ARDL model has shown.

We also performed a Granger Causality (GC) test with the results displayed in Table 10. The null hypothesis is that the excluded variable (inflation) does not Granger cause the main equation variable (corruption). From Table 10 that hypothesis was rejected. The order of variables was switched and the null hypothesis that the excluded variable (corruption) does not Granger cause the main equation variable (inflation) was also tested. As Table 10 shows the null hypothesis could not be rejected indicating a one-direction causality from inflation to corruption. This confirmed that the direction of causation flows from inflation to corruption.

Table 9

Vector Auto Regression Results

Variables	Corruption Dependent	Inflation Dependent
L.COC	0.421**	-6.601
	(0.169)	(18.565)
L.Inflation	-0.004**	0.189
	(0.002)	(0.212)
Constant	-0.015	11.818***
	(0.041)	(4.482)
Observations	22	22

Note: *Standard errors are in parentheses. *** indicates significance at 0.01 level, ** indicates significance at 0.05 level and *indicates significance at 0.1level of significance*

Table 10

Results of Granger Causality Analysis between COC and Inflation

Equation	Excluded	Chi2	df	Prob>chi2
COC	Inflation	3.9252	1	0.048
COC	ALL	3.9252	1	0.048
Inflation	COC	.12641	1	0.722
Inflation	ALL	.12641	1	0.722

4.5. Nonlinear Autoregressive Distributed Lag Results

Analysis of Short-run results

As reported in Table 11, there is suggestion of asymmetry in the short run responses of corruption to changes in inflation because when inflation increases, COC reduces by 0.01, which means corruption increases by 0.01 because of how COC is defined. On the other hand, when inflation falls, COC falls by 0.022 which also means COC increases by 0.02 which is clearly a different response in magnitude from the response of corruption to rising inflation. This implies that increases and decreases of inflation both cause an increase in corruption albeit by different magnitude. However, while the coefficient of the negative change in inflation is significant, the coefficient of the positive change in inflation is insignificant (so a Wald test of significance difference is impossible) meaning asymmetry cannot be confirmed in the short run. In comparison the lags of inflation display no asymmetry in their response to corruption. Although they show different magnitude, only the lag of the positive change in inflation is significant, the negative change is insignificant. The exchange rate variable also shows no significant asymmetry in the short run because the coefficients are all insignificant.

Similarly, when the CPI is used as the measure of corruption, we find that there is no asymmetry in the short run between corruption and inflation because there is no statistically significant difference between the coefficients of the decreasing and the increasing components of inflation (see table 12). In fact, in the short run, the coefficients of both current inflation and its lags are statistically insignificant, whether the shock is positive or negative. The result is similar for the Exchange rate. Although both the differenced positive shock and its lag are significant, there are no valid coefficients for the corresponding negative shocks. So, we conclude that both inflation and exchange rates do not have an asymmetric relationship with corruption in the short run.

Table 11

Results of NARDL (p(2) q(2)) Estimation Results with COC Dependent Variable

Source	SS	df	MS					
				Number	of	obs	=	21
Model	0.230	14	0.016	Prob	>	F	=	0.013
Residual	0.015	6	0.002	R-squared	=	0.941		
Total	0.245	20	0.012	Root	MSE	=	0.049	

_dy	Coef.	Std.Err.	t	P>t	[95%Cof.	Interval]

COC_L1.	-1.278	0.240	-5.320	0.002	-1.866	-0.690
L1.Inflation_p	-0.036	0.008	-4.270	0.005	-0.057	-0.015
L1.Inflation_n	-0.027	0.006	-4.410	0.005	-0.042	-0.012
L1.ExchRate_p	-0.069	0.036	-1.890	0.108	-0.158	0.020
dCOC	0.014	0.151	0.090	0.931	-0.355	0.382
_dx1p						
dInflation_p	-0.010	0.006	-1.740	0.133	-0.025	0.004
L1Inlfation_p	0.012	0.004	3.270	0.017	0.003	0.021
_dx1n						
dInflation_n	-0.022	0.006	-3.850	0.009	-0.036	-0.008
L1Inflation_n	0.004	0.003	1.660	0.147	-0.002	0.011
_dx2p						
dExchRate_p	-0.005	0.070	-0.070	0.943	-0.177	0.166
L1ExchRate_p	0.124	0.081	1.530	0.176	-0.074	0.322
VoiceAndAccountability	1.117	0.234	4.780	0.003	0.545	1.689
RuleOfLaw	-0.284	0.393	-0.720	0.497	-1.247	0.678
RGDP	0.000	0.000	0.150	0.883	-0.000	0.000
_cons	-0.045	0.183	-0.250	0.813	-0.493	0.402

(10 missing values generated)
Asymmetry statistics:

	Long-run	effect	[+]	Long-run	effect	[-]
Exog. var.	coef.	F-stat	P>F	coef.	F-stat	P>F
Inflation	-0.028	15.920	0.007	0.021	12.550	0.012
ExchRate	-0.054	6.174	0.047	0.000	.	.

	Long-run	asymmetry	Short-run	asymmetry
	F-stat	P>F	F-stat	P>F
Inflation	7.184	0.037	3.921	0.095
ExchRate	6.174	0.047	0.937	0.370

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

Table 12
Results of NARDL [p(2)q(2)] Estimation with CPI Dependent

Source	SS	df	MS	Number	of	obs	=	21
Model	161	14	11.53	Prob	>	F	=0.0284	
Residual	13.76	6	2.294	R-squared	=	0.9215		
Total	175.24	20	8.762	Root	MSE	=1.5145		

_dy	Coef.	Std.Err.	t	P>t	[95%Cof.	Interval]
CPI_L1.	-1.196	0.4062	-2.94	0.026	-2.189	-0.202
L1.Inflation_p	0.131	0.403	0.32	0.757	-0.855	1.116
L1.Inflation_n	0.1787	0.294	0.61	0.565	-0.5401	0.8974
L1.ExchRate_p	-4.942	1.296	-3.81	0.009	-8.114	-1.769
dyCPI	-0.241	0.2081	-1.16	0.291	-0.7504	0.2680
dInflation_p	0.0498	0.261	0.190	0.855	-0.589	0.688
L1Inlfation_p	-0.1364	0.157	-0.870	0.418	-.520	0.247
dInflation_n	-0.0145	0.2083	-0.07	0.947	-0.5242	0.4953
L1Inflation_n	-0.1153	0.1153	-1	0.356	-0.3976	0.1669
dExchRate_p	7.657	2.326	3.29	0.017	1.964	13.3501
L1.ExchRate_p	11.233	3.337	3.37	0.015	3.068	19.3969

dExchRate_n	0			(omitted)		
L1ExchRate_n	0			(omitted)		
VoiceAndAccountability	-3.7156	5.0768	-0.73	0.492	-16.1381	8.7068
RuleOfLaw	-22.216	-22.2163	9.2345	-2.41	0.053	-44.8123
RGDP	4.54E-10	1.28E-10	3.54	0.012	1.40E-10	7.68E-10
_cons	39.779	9.374	4.24	0.005	16.842	62.715

(10 missing values generated)
Asymmetry statistics:

	Long-run	effect	[+]	Long-run	effect	[-]
Exog. var.	coef.	F-stat	P>F	coef.	F-stat	P>F
Inflation	0.109	0.1268	0.734	-0.149	0.5135	0.501
ExchRate	-4.132	16.24	0.007	0	.	.

	Long-run	asymmetry	Short-run	asymmetry
	F-stat	P>F	Table 12.	P>F
Inflation	0.085	0.781	0.02154	0.888
ExchRate	16.24	0.007	14.63	0.009

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

Results of Cointegration Analysis

Table 13 below provides evidence of cointegration between the variables when asymmetry is accounted for in the NARDL framework of **Shin Yu & Greenwood-Nimoh, (2014)**. From Table 13 with COC as the dependent variable, the value of the F-statistic of 14.4 is greater than the upper Bound value of 4.68 (see Table 5B) for the Bounds test due to **Pesaran** and **Shin (1999)** and suggested by **Shin, Yu** and **Nimoh, 2014 (Fahhem et al, 2020)**. Likewise, with the CPI as the dependent variable, the cointegration test statistic of 6.93 indicates an existence of cointegration since it is larger than the upper bound of 4.68 (see table 6).

Table 13

NARDL Cointegration and Diagnostic Tests

Test	*Control of Corruption (COC)*		*Corruption Perception Index (CPI)*	
Cointegration Test (F)	14.48		6.93	
Diagnostic Test	*Statistic*	*p-value*	*Statistic*	*p-value*
Portmanteau test up to lag 8 (chi2)	5.786	0.6712	15.58	0.0487
Breusch/Pagan heteroskedasticity test (chi2)	.2196	0.6394	2.958	0.0855
Ramsey RESET test (F)	.4995	0.7085	1.605	0.3534
Jarque-Bera test on normality (chi2)	1.655	0.4371	4.056	0.1316

Analysis of Long-Run Results

From Table 11 when inflation increases in the long run, COC reduces by 0.028 and is significant. However, since COC represents control of corruption and not corruption, a reduction in COC of 0.028 means corruption goes up by 0.028. So, in the long run when inflation increases, corruption increases in a significant way. In comparison, when inflation decreases in the long run, COC increases by 0.021. However, since COC represents control of corruption and not corruption, an increase in COC of 0.021 means corruption falls by 0.021 and the result is statistically significant. These results imply that in the long run, when inflation decreases, corruption decreases in a significant way.

Since there is a difference in the magnitude of the coefficients when inflation increases compared to when inflation decreases in the long run, this is indicative of asymmetry in the long run. Using a Wald test, we test for a statistically significant difference between the positive and negative long run coefficients. From the last part of Table 10, since the P-value for the test is 0.037 which is less than 0.05, there is confirmation of long run asymmetry in the response of inflation to corruption.

In comparison, the exchange rate has no asymmetric relationship with corruption in the long run. Although the table shows that in the long run, a positive change in exchange rate results in a 0.051 reduction in corruption control, the coefficient for corresponding negative change is insignificant. Asymmetry between corruption and exchange rate cannot be confirmed.

Contrary to the COC results, in the long run, both the positive and negative shocks in inflation are not significant when CPI is the dependent variable (see table 12). The positive shock in the exchange rate is significant, however, there is no valid corresponding coefficient for the negative shock. Hence, we conclude that there is no long run asymmetry between inflation and corruption perception index.

5. CONCLUSSION AND SUGGESTIONS FOR POLICY MAKING

The aim of this study was to empirically examine the relationship between inflation and corruption, using the control of corruption as the key corruption variable. The ARDL model shows that there is a significant positive relationship between inflation and corruption. Though the error correction model shows the relationship is negative in the short run, it also confirms that, in the long run, a rise in inflation leads to an increase in corruption. The VAR results also confirmed the existence of a positive relationship between inflation and corruption. We further found that causality runs from inflation to corruption. The result is consistent with empirical findings on the topic confirming a positive relationship between corruption and inflation, with causality running from inflation to corruption (**Piplica, 2011; Turedi & Altiner, 2016; Ackca, 2012; Uroos et al, 2021** and (**Braun & di Tella, 2004**).

Corruption seems to undermine growth in Ghana. This research has shown that Ghana's increasing inflation as well as previous period corruption will exacerbate corruption further. Fiscal and monetary authorities must remain disciplined and must implement fiscal and monetary policies to reduce inflation and corruption now. Since corruption on its own has dire effects on the economy and inflation encourages corruption in Ghana, government must redouble efforts to tackle inflation to reduce corruption. Specifically, inflation targeting must take center stage as inflation makes corruption worse and inflation has been severe in Ghana, reaching over 50% for consecutive months in 2022-2023. Severe deficit financing by the Bank of Ghana must be replaced by zero financing to meet IMF requirements for a bailout. Over-ambitious government expenditure on the back of expected windful revenues from the oil sector must be guided by recent disinterest in African oil sector investment by the oil majors and the economic quagmire the Ghanaian economy is currently in.

REFERENCES

Abo, S.C., Hammond, P., Amissah, E. (2021). Bilinear Regression Methods for Macroeconomic Impacts on Corruption in Ghana. *International Journal of Economics, Business and Management Research*. 5(10)~~References~~

Abu, N., Karim, M. Z. A., & Aziz, M. I. A. (2015b). Corruption, political instability, and economic development in the Economic Community of West African States (ECOWAS): Is there a causal relationship?, *Contemporary Economics*, *9*(1), 45–60

Abu, N., & Staniewski, M. W. (2019). Determinants of Corruption in Nigeria : Evidence from Various Estimation Techniques. Economics Research -Ekonomska Istravizivanja, 32, 3058-3082

Ades, A., & Di Tella, R. (1997). The new economics of corruption: A survey and some new results. *Political Studies*, *45*(3), 496–515

Ades, A., & Di Tella, R. (1999). Rents, competition, and corruption. *American Economic Review*, *89*(4), 982–993

Aidt, T. S. (2003). Economic analysis of corruption: A survey. *Economic Journal*, *113*, 632–652

Aidt, T. S., & Dutta, J. (2001). *Policy compromises: Corruption and regulation in a dynamic democracy*. Working Paper, University of Cambridge

Akca, H., Ata, Y., A., & Karaca (2012). Inflation and Corruption Relationship: Evidence from Panel Data in Developed and Developing Countries. International Journal of Economics and Financial Issues. *Economics Journals*, 2(3), 281-295

Alam, M. S. (1990). Some economic costs of corruption in LDC's. *Journal of Development Studies*, *27*(1), 89-97

Alesina, A. & Angeletos, G. M. (2005) Corruption, inequality, and fairness. *Journal of Monetary Economics*, *52*, 1227–44

Ali, B., S., M., & Sassi, S. (2016). The Corruption-Inflation Nexus: Evidence from Developed and Developing Countries. *The B.E Journal of Macroeconomics*, *16*(1), 125-144

Al-Marhubi, F. A. (2000) Corruption and inflation, *Economics Letters*, *66*, 199–202

Al-Sadiq, A. (2009). The Effects of Corruption on FDI Inflows. Cato Journal, 29(2), 267-294. Retrieved from https: //heinonline.org /HOL/LandingPage?handle=hein.journals/c a toj29&div=25&id=&age=

Akinpelu, Y. A., Ogunseye, T. O., Bada, O. T., & Agbeyangi, B. A. (2013). The socio-economic determinants of corruption in Nigeria. *European Journal of Humanities and Social Sciences*, *19*(1), 923–938.

Alhassan, A. L., & Fiador, V. (2014). Insurance-growth nexus in Ghana: An autoregressive Distributed lag bounds cointegration approach. *Review of Development Finance*, *4*(2), 83–96

Ali, A. M., & Isse, H. S. (2003). Determinants of corruption: A cross-country comparison. *Cato Journal*, *22*(3), 449–466

Alt, J. E., & Lassen, D. (2003). The political economy of institutions and corruption in American states. *Journal of Theoretical Politics*, *15*(3), 341–365

Ang, Y. Y. (2020). Unbundling corruption: Revisiting six questions on corruption. Global Perspectives, *1*(1)

Ang, Y. Y. (2020). China's gilded age: The paradox of economic boom and vast corruption. Cambridge University Press

Antwi, S. K. &Yusheng, K., Musah, M., Donkor M., & Kasim, H. (2020). "Does Corruption Grease or Sand the Wheels of Economic Growth in Ghana? An ARDL Bounds Test," *the Economics and Finance Letters, Conscientia Beam, 7*(2),162-178

Anwar, M. & Shabbir, G. (2007). Determinants of Corruption in Developing Countries. *Pakistan Development Review, 46*(4), 751-764. doi:10.30541/v46i4IIpp.751-764

Armah, S. (2020). *Nurturing Sustainable Prosperity in West Africa: Examples from Ghana*. London: Palgrave-Macmillan

Ata, A.Y., & Arvas, M. A. (2011), "Determinants of Economic Corruption: A Cross Country Data Analysis", *International Journal of Business and Social Science, 2*(13), 161- 169

Ayodeji, I., O. (2020). Panel Logit Regression Analysis of the Effects of Corruption on Inflation Pattern in the Economic Community of West African States, Heliyon, 6(12)

Banerjee, A. V. (1997) A theory of misgovernance. *Quarterly Journal of Economics*, 112, 1289– 332

Bardhan, P. (2006). The economist's approach to the problem of corruption. *World Development*, *3*(4), 341–48

Bardhan, P. (1997). "Corruption and development: A review of issues." *Journal of Economic Literature, 35*(3), 1320-1346

Bayley, D.H. (1966). The Effects of Corruption in a Developing Nation. Western Political Quarterly, *19*(4), 719-732

Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy*, *76*(2), 169–217. http://www.jstor.org/stable/1830482

Becker, G. S., & Stigler, G. J. (1974). Law Enforcement, Malfeasance, and Compensation of Enforcers. *The Journal of Legal Studies*, *3*(1), 1–18. H http://www.jstor.org/stable/724119

Beck, P.J, & Maher, M.W. (1986). A Comparison of Bribery and Bidding in Thin Markets, Economics Letters. 20(1), 1-5

Blackburn, K., Bose, N. and Haque, M. E. (2006). The Incidence and Persistence of Corruption in Economic Development, Journal of Economic Dynamics, and Control. *30*(24), 47–67

Bliss, C., & Tella, R. D. (1997). Does competition kill corruption? *Journal of political economy*, *105*(5), 1001-1023

Bloomberg. (2022, October 17). *Ghana's Cedi Slumps to World's Worst Performer Amid IMF Talks.* Retrieved from Bloomberg: https:// www. bloomberg. com/news/articles 2022-10-17/ghana-currency-slumps-to-world-s-worst-performer-versus-dollar ? le ad Source=uverify%20wall

Bologna P. J. (2018), 'Corruption: The Good, the Bad, and the Uncertain', *Review of Development Economics*, *22*(1): 311–332.

Bologna P. J. & Grier, K. B. (2020). 'Corruption & the Wealth of Nations', Working Paper.

Braun & Di Tella (2004). "Inflation, Inflation Variability, and Corruption" *Economics and Politics*, *16*(1), 77-100

Brunetti, A. (1995). Political variables in cross-country growth analysis. Working paper, Harvard University, Cambridge, MA

Castro, C., & Nunes, P. (2013). Does corruption inhibit foreign direct? *Política, 51*(1), 61-83. doi:10.5354/0716-1077.2013.27418

Chowdhury, S. K. (2004). The effects of democracy and press freedom on corruption: an empirical test, *Economics Letters*, *85*, 93–101

Cuervo-Cazurra, A. (2008). Better the Devil You Don't Know: Types of Corruption and FDI in Transition Economies. *Journal of International Management*, *14*(1), 12-27. doi:10.1016/j.intman.2007.02.003

Dey, H. K. (1989). The genesis and spread of economic corruption: a micro theoretic interpretation, *World Development*, *17*, 503–11

Easterly W. (2001). *The Elusive Quest of Growth. Economists' Adventures and Misadventures in the Tropics*, Cambridge, Mass. MIT Press

Ehrlich, I. and Lui, F. T. (1999). Bureaucratic corruption and endogenous economic growth, Journal of Political Economy, *107*(2), 70–93

Ekpo, M. (1979). *Gift-giving and bureaucratic corruption in Nigeria*. In M. Ekpo (Ed.), Bureaucratic corruption in sub-Saharan Africa: Causes, consequences, and controls. *University Press of America*, Washington, DC. 112-132

Epaphra, M., & Massawe, J. (2017). The Effect of Corruption on Foreign Direct Investment: A Panel Data Study. *Turkish Economic Review*, *4*(1), 19-54. Retrieved from www.kspjournals.org

Elkamel, H. (2019). Corruption and Inflation : Evidence from US States. Journal of Financial Economic Policy, Emerald Group Publishing Limited 11(2), 251-262

Evrensel A. (2010). "Institutional and Economic Determinants Of Corruption: A Cross-Section Analysis", *Applied Economics Letters*, *17*, 551–554.

Fisman, R. & Svensson, J. (2007). 'Are Corruption and Taxations Really Harmful to Growth? Firm Level Evidence', *Journal of Development Economics*, *83*(1): 63–75

Fitch. (2022). *Fitch Downgrades Ghana to 'CC'*. Retrieved from FitchRatings: https://www.fitchratings.com/research/sovereigns/fitch-downgrades-ghana-to-cc-23-09-2022

Francis, D.R. (2003). "Why fighting corruption helps the poor", Christian Science Monitor, November 13, available at: www.csmonitor.com/cgi-bin/ (accessed March 26, 2007).

Getz K. A., and Volkema, R. J. (2001), "Culture, Perceived Corruption, and Economics: A Model of Predictors and Outcomes", *Business and Society*, *40*(1), 7-30

Ghanaweb (2023). IMF Assigns Resident Advisor to Bank of Ghana. Retrieved from https://www.ghanaweb.com/GhanaHomePage/NewsArchive/IMF-assigns-Resident-Advisor-to-Bank-of-Ghana-1714298

Ghanaweb (2022). BOG Beats Retreat on Printing GHS 22 Billion to Fund Budget - Minority. Retrieved from https://www.ghanaweb.com/GhanaHomePage/NewsArchive/BoG-beats-retreat-on-printing-GH-22-billion-to-fund-budget-Minority-1606934

Ghanaweb (2022). *Ghana Now Classified as High Debt Distressed Country-World Bank Report*. Retrieved from https://www.ghanaweb.com/GhanaHomePage/business/Ghana-now-classified-as-high-debt-distressed-country-World-Bank-report-1636247#:~:text=Ghana%20has%20been%20classified%20as

Ghulam S. & Mumtaz A. (2007) Determinants of Corruption in Developing Countries. *The Pakistan Development Review*, *46*(4)

Glynn, P., Kobrin, S. and Naim, M. (1997), The Globalization of Corruption, Institute for

International Economics, Washington, DC, available at: www.petersoninstitute.org/ publications/chapters_preview/12/1iie2334.pdf
Goel, R. K., & Nelson, M. A. (2005). Economic freedom and political freedom: Cross-country influences on corruption. *Australian Economic Papers*, *44*(2), 121–133.
Goel, R. K., & Nelson, M. A. (2010). Causes of corruption: History, geography, and government. *Journal of Policy Modeling*, *32*(4), 433–447.
Goel, R. K., & Nelson, M. A. (2011). Measures of Corruption and Determinants of US Corruption. *Economics of Governance*, *12*(2), 155–176.
Gokcekus., O¨. and Knorich, J. (2006). Does quality of openness affect corruption? *Economics Letters*, *91*, 190–96
Goldsmith, A. (1999). "Slapping the grasping hand: correlates of political corruption in emerging markets", *American Journal of Economics and Sociology*, *58*(4), 865-83, available at: www.Jstor.org/ (accessed November 13, 2006)
Graf, L., J. (1999). Corruption in Empirical Research—A Review. Transparency International Working Paper. Berlin: Transparency International
Gyimah-Brempong, K., & de Camacho, S. M. (2006). Corruption, growth, and income distribution: Are there regional differences? Economics of Governance, *7*(3), 245–269. doi:10.1007/s10101-005-0008-2
Gyimah-Brempong, K. (2002). Corruption, economic growth, and income inequality in Africa. *Economics of Governance*, *3*(3), 183–209. doi:10.1007/s101010200045
Huang, M., H., Wang, E. T., & Seidmann, A. (2007). Price Mechanism for Knowledge Transfer: An Integrative Theory. *Journal of Management Information*, *24*(3), 79-108. doi: 10.2753/MIS0742-1222240303

Huntington, S. P. (1979). *Modernization and corruption*. In M. Ekpo (Ed.), Bureaucratic corruption in sub-Saharan Africa: Causes, consequences, and controls (pp. 313-324). Washington, DC: University Press of America.

Huntington, S. P. (1968). *Political Order in Changing Societies*. New York, NY: Oxford University Press.
Husted, B. W. (1999). Wealth, culture and corruption. *Journal of International Business Studies*, *30*(2),, 339-360.

Hunter, J., Wu, F. (2010). Multifactor Consumption-Based Asset Pricing Models Using the US Stock Market as a Reference: Evidence from a Panel of Developed Economies. Economics and Finance Working Paper Series, Working Paper No. 1017.
Ilhem, A. & Johanne, K. (2011). "The Arab Spring and the Role of ICTs" International Journal of Communication 5 (2011), Feature 1435–1442
International Monetary Fund. (1998). *International Financial Statistics Yearbook*. Washington, DC

Isiwu, G. D., & Aminu, H. U. (2018). Relationship Between Corruption and Inflation in Nigeria. *International Journal of Science and Research*, *7*(12)

Jagdish, B. (1982). "Directly Unproductive Profit-Seeking (DUP) Activities" *JPE*, *90*(5), 988-1002
Jain, A. K. (2001). Corruption: A review. *Journal of economic surveys*, *15*(1), 71-121
Johnston, M. (1997). The vices—and virtues—of corruption. Current History. *96*(611), 270-273

Kamps, A. (2006), The Euro as Invoicing Currency In International Trade. Workıng Paper Series, No 665/August.

Kaufmann, D., Kraay, A. & Mastruzz, M. (2010). The Worldwide Governance Indicators: A Summary of Methodology, Data and Analytical Issues. World Bank Policy Research Working Paper No. 5430. Available online: https://openknowledge.worldbank.org/bitstream/handle/10986/3913/WPS5430.pdf?sequence=1 (accessed on 30 June 2020).

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2005). Governance Matters IV: Governance Indicators for1996–2004, World Bank, Washington, DC. Available at http://www.worldbank.org/wbi/governance/wpgovernance.htm (accessed 12 September 2008)

Kaufmann, D. and S.-J. Wei, (1999). Does grease money speed up the wheels of commerce? NBER Working Paper No. 7093.

Kaufmann D., A. Kraay, and P. Zoido-Lobaton (1999b). “Governance matters.” World Bank Working Paper 2powell196.

Kaufmann, D. (1997). “Corruption: The Facts.” *Foreign Policy*: *JSTOR*. *107*, 114–31, https://doi.org/10.2307/1149337

Kim, H, Powell, G.B. & Fording, R.C. (2006). Electoral Systems, Party Systems, and Substantive Representation: An Analysis of Distortion in Western Democracies. *Midwest Political Science Association*, Chicago.

Klitgaard, R. (1998). *Controlling Corruption*. Berkeley: University of California Press.

Knack, S. & Azfar, O. (2003). Trade Intensity, Country Size and Corruption. *Economics of Governance*, *4*, 1-18.

Kneller, R. & Stevens, P.A. (2003). “The specification of the aggregate production function in the presence of inefficiency.” Economics Letters 81 2, 223-226.

Krueger, A.O. (1974). The political economy of the rent-seeking society. *The American Economic Review*, *64*, 291–303.

Kunicova, J. & Rose-Ackerman, S. (2005). Electoral Rules and Constitutional Structures as Constraints on Corruption. British Journal of Political Science 35:4, 573-606.

Kurer, O. (1993). “Clientelism, Corruption and the allocation of resources.” Public Choice. 77(2), 259-273.

Laffont, J. & N´guessan, T., 1999. Competition and corruption in an agency relationship. *Journal of Development Economics*, *60*, 271-295.

Lalountas, D., Manolas, G. & Vavouras, I., (2011). Corruption, globalization and development: How are these three phenomena related?. *Journal of Policy Modeling*, *33*(4).

Lambsdorff, J. G. (2007). *The institutional economics of corruption and reform: Theory, evidence and policy*. Passau: Cambridge University Press

Lambsdorff, J. G. (2006). *Causes and consequences of corruption*: What do we know from a cross-section of countries?. In: S. Rose-Ackerman, ed. International Handbook on the Economics of Corruption. Northampton, Massachusetts: Edward Elgar Publishing, Inc., pp. 3-51.

Lambsdorff, J.G. & Teksoz, S.U. (2004). Corrupt relational contracting. In: Lambsdorff, G.J , Schramm, M. & Taube, M. (Eds.), The new institutional economics of corruption. 138– 151. New York: Rutledge

Lambsdorff, J.G. (2003). “How corruption affects productivity.” Kyklos *56*(4) 457-474.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. W. (1999). The quality of government. *Journal of Law, Economics and Organization*. *15*, 222–79

Lee, K.Y. (2000). *From Third World to First, The Singapore Story*: 1965-2000, Times Media, Singapore.

Leff, N. H. (1964). Economic development through bureaucratic corruption. *American Behavioral Scientist*, 8(3), 8-14. Available at: https:// doi.org/ 10.1177/ 002764264008030З.

Leff, N.H. (1964). "Economic development through bureaucratic corruption." *American Behavioral Scientist 8*(3), 8-14. Reprinted in Political corruption: A handbook, A.J. Heidenheimer, M. Johnston and V.T. LeVine (eds.), Oxford, Transaction Books, 389-403, 1989

Leys, C. (1965). What is the problem about corruption? *The Journal of Modern African Studies*, *3*(2), 215-230. Available at: https://doi.org/10.1017/s0022278x00023636.

Leys, C. (1965). "What is the problem about corruption?" *Journal of Modern African Studies, 3*(2) 215-230. Reprinted in Political corruption: A handbook, A.J. Heidenheimer, M. Johnston and V.T. LeVine (eds.), Oxford, Transaction Books, 51-66, 1989.

Lien D.H.D. (1986). "A note on competitive bribery games." *Economics Letters. 22*, 337-341.

Lui, F. (1985). An equilibrium queuing model of corruption. *Journal of Political Economy*, 93(4), 760-781. Available at: https://doi.org/10.1086/261329.

Lui, F. T. (1996) "Three Aspects of Corruption." Contemporary Economic Policy 14(3): 26–29.

Lui, F.T. (1985). "An equilibrium queuing model of bribery." *Journal of Political Economy 93*(4), 760-781.

Luo, Y. (2004). An Organizational Perspectives of Corruption, Management and Organization Review, 1(1), 119-154.

Malpass, D. (2022, April). *The World Bank* . Retrieved from Addressing Challenges to Growth, Security and Stability - Scene-Setter Speech by World Bank Group President David Malpass: https://www.worldbank.org/en/news/speech/2022/04/12/addressing-challenges-to-growth-security-and-stability-scene-setter-speech-by-world-bank-group-president-david-malpass

Maria, N.S., Susilowati, I., Fathoni, S., & Mafruhah, I. (2021). The Effect of Education and Macroeconomic Variables on Corruption Index in G20 Countries. *Economies*. *9*(1), 23

Mauro, P. (1998). Corruption and the composition of government expenditure. *Journal of Public Economics*, *69*(2), 263-279. Available at: https://doi.org/10.1016/s0047-2727(98)00025-5

Mauro, P. (1997), *The Effects of Corruption on Growth, Investment, and Government Expenditure, in Corruption in the World Economy*. (Ed): Kimberly A. Elliott, Washington DC: Institute for International Economics, 83-107.

Mauro, P. (1995). Corruption and growth. *The Quarterly Journal of Economics*, *110*(3), 681–712. doi:10.2307/2946696

Mauro, P. (1998). "Corruption and the composition of government expenditure." *Journal of Public Economics 69*(2), 263-279.

Méon, P.-G. and K. Sekkat (2005). "Does corruption grease or sand the wheels of growth?" *Public Choice*. *122* (1-2), 69-97

Mo, P. H. (2001). Corruption and economic growth. *Journal of Comparative Economics*, *29*(1), 66–79. doi:10.1006/jcec.2000.1703

Moody's Investor Services (2022). *Moody's downgrades Ghana's rating to Caa2 and places it on review for downgrade.* Retrieved from Moody's: https://www.moodys.com/research/Moodys-downgrades-Ghanas-rating-to-Caa2-and-places-it-on--

PR_469810#:~:text=The%20rating%20downgrade%20to%20Caa2,increasing%20the%20risk%20of%20default.

Mookherjee, D., & Png, I. (1989). Optimal auditing, insurance, and redistribution. *The Quarterly Journal of Economics*, *104*(2), 399–415. doi:10.2307/2937855

Moyo, D. (2009). *Dead aid: Why aid is not working and how there is a better way for Africa*. Macmillan

Myjoyonline (2018). *Begotten from a Womb of Impunity: A Lion Called June 4th Insurgency.* Retrieved from https://www.ghanaweb.com/GhanaHomePage/features/Begotten-from-a-womb-of-impunity-A-lion-called-June-4th-insurgency-657547

Myrdal, G. (1970). *Corruption: Its causes and effects*. In A. J. Heidenheimer (Ed.), Political corruption: Readings in comparative analysis (pp. 540-545). New York: Holt, Rinehart & Winston.

Nguyen, T.T, & Vandijk, M.A (2012). Corruption, Growth and Governance: Private Versus State- Owned Firms in Vietnam. *Journal of Banking and Finance, 36*, 2935-2948

Nsor-Ambala, R., & Coffie, C. P. K. (2022). Non-linear ADRL estimation of corruption and FDI inflow to Ghana". *Journal of Financial Crime*, *29*(3), 1042–1063. doi:https://doi.org/ 10.1 108/J FC-05-2021-0106

Nye, J. S. (1979). *Corruption and political development: A cost-benefit analysis*. In M. Ekpo(Ed.), Bureaucratic corruption in sub-Saharan Africa: Causes, consequences, and controls (pp. 57-79). Washington, DC: University Press of America.

Nye, J. S. (1967). Corruption and political development: A cost-benefit analysis. *American Political Science Review*, *61*(2), 417-427. Available at: https://doi.org/10.2307/1953254.

Nugroho S. B. M., Susilowati, I., Fathoni, S. & Mafruhah, I. (2021). The Effect of Education and Macroeconomic Variables on Corruption Index in G20 Member Countries. *Economies*, *9*(2)

Oke & Sanusi (2021). Re-Examining the Nexus Between Corruption and Economic Growth in Nigeria: An ARDL Approach. *Journal of Economic Studies*, *18*(1)

Olken, B, & Pande. R. (2011). "Corruption in Developing Countries". *Annual Review of Economics*, *4*, 479-509

Omodero. (2019). Effect of Corruption on Foreign Drict Investment Inflows in Nigeria. *Studia Universitatis Economic Series*, *29*(2), 54-66. doi:0.2478/sues

Office of Special Prosecutor (2022). *Special Prosecutor's Half Yearly Report, December 2022*. Accra, Ghana.

Özsahin & Üçler (2017). The Consequences of Corruption on Inflation in Developing Countries: Evidence from Panel Cointegration and Causality Tests. *Economies*, *5*(49), 1-15

Paldam, M. (2002) "The Cross-Country Pattern of Corruption: Economics, Culture and Seesaw Dynamic", *European Journal of Political Economy*, *18*, 215-240

Park, H. (2003). "Multinational Business Review "Determinants of Corruption: A cross-section analysis". *11*(2), 29-46

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics*, *16*(3), 289–326

Pesaran, M. H. & Shin, Y. (1998), 'An autoregressive distributed-lag modelling approach to cointegration analysis. *Econometric Society Monographs 31*, 371–413.

Quah, J. S.T. (2022). Lee Kuan Yew's role in minimizing corruption in Singapore. *Public Administration and Policy*, *25*(2), 163-175

Reinganum, J. F., & Wilde, L. L. (1985). Income tax compliance in a principal-agent framework. *Journal of public economics*, *26*(1), 1-18.

Robinson, M. (1998). "*Corruption and Development: An Introduction*" in M. Robinson, ed., Corruption and Development, Frank Cass, London, 1–14.

Rodham, V. H; Zahl, H; Goldacre Platt, H, G and Harwood, A (2022) " Why Corruption matters and its impact on society". *British Journal of Criminology, Law & Justice. 2*(1), 31 - 45

Rose-Ackerman, S. (1978). *Corruption: A study in political economy*. New York, NY: Academic Press

Turedi, S. & Altina, A. (2016). "Economic and Political Factors Affecting Corruption in Developing Countries" *International Journal of Economics Resources*, *7*(1), 104 – 120

Sandholtz, W., Koetzle, W., 2000. Accounting for Corruption: Economic Structure, democracy, and trade. *International Studies Quarterly*, *44*(1), 31-50.

Sassi, S. & Gasmi, A. (2017). The Dynamic Relationship Between Corruption–Inflation: Evidence from Panel Vector Autoregression, *68(*4), 458-469

Serra, D. (2006). Empirical determinants of corruption: A sensitivity analysis. Public Choice 126: 225–56

Shabbir, M.S., & Yaqoob, N. (2019). The impact of technological advancement on total factor productivity of cotton: a comparative analysis between Pakistan and India. *Journal of Economic Structures*, *8*(27). doi:10.1186/s40008-019-0160-4

Shah, I.H. & Aish, K. (2022), "A nexus between corruption, money laundering (ML) and Inflation: evidence from South Asian countries." *Journal of Money Laundering Control*, *25*(4), 730-741

Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2011). Modeling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. *Academia*. Retrieved from https ://www. Researchgate .net/publication/329 174724_A_ Nonlinear_A utoregressiv e _Distributed _Lag_NARDL_Analysis_on _the_Determinants_of_ Vietnam's_Stock_Market

Shleifer, A., & Vishny, R. W. (1993). Corruption. *Quarterly Journal of Economics*, *108*(3), 599- 617. Available at: https://doi.org/10.2307/2118402

Swamy, A., Knack, S., Lee, Y. 7& Azfar, O. (2001). "Gender and Corruption." *Journal of Development Economics*, *64*, 25–55

Tanzi, V., & Davoodi, H. (1998). Corruption, public investment and growth. In the Welfare State, Public Investment and Growth, *Springer*, 41-60

Tommasi, M., & Weinschelbaum, F. (1999). What is the right level?: A principal-agent building block for the study of decentralization and integration

Torrez, J. (2002). The effect of openness on corruption. *Journal of International Trade & Economic Development*, *11*(4), 387-403. doi:10.1080/096381902200014267

Touati, K. (2014), "Determinants of Economic Corruption in the Arab Countries: Dangers and Remedies", *Journal of Economics Studies and Research*, 1-15

Transparency International. (2002). Corruption in the official arms trade. London: Transparency International.

Transparency International (2021). *Corruption Perceptions Index*. Retrieved from https://www.transparency.org/en/cpi/2021?gclid=EAIaIQobChMIqOben6LLgIVxbTtCh12yAvbEAAYASAAEgILlDBwE

Treisman, D. (2000). The causes of corruption: a cross-national study. *Journal of Public Economics*, *76*, 399–457

Tullock, G. (1996). "Corruption Theory and Practice." *Contemporary Economic Policy*, *14*(3): 6–13

Tullock, Gordon (1967) "The Welfare Costs of Tariffs, Monopolies and Theft." *Western Economic Journal*, *5*, 224-232

Uroos, A., Shabbir, M.S., Zahid, M.U., Yahya, G., &Abbasi, B.A (2022). Economic Analysis of Corruption: Evidence from Pakistan. *Transnational Cooperation Review*, *14*(1), 46- 61

Guterres, A. (2018). "Global Cost of Corruption at Least 5 Per Cent of World Gross Domestic Product, UN Secretary-General Tells Security Council, Citing World Economic Forum Data". *8346th Annual Meeting of the UN Genral Assembly*

Wei, S.-J. (2000). Negative Alchemy: Corruption and Composition of Capital Flows. *OECD Development Centre Working Papers, 165.* Retrieved from https://doi.org/10.1787/201684580375

Wei, S.-J. (1997). Why is Corruption so Much More Taxing Than Tax: Arbitrariness Kills. *National Bureau of Economic Research Working Paper Series, 6255.* doi:10.3386/w6255

Wooldridge, J. M. (2009). *Introductory Econometrics: A Modern Approach* (7th Edition).

Cengage Learning

World Bank (1997). *Helping Developing Countries Combat Corruption: The Role of the World Bank.* New York: Oxford University Press, pp. 39-51

Wheeler, D., & Mody, A. (1992). International investment location decisions: The case of U.S. firms. *Journal of International Economics*, *33*(1-2), 57-76. Retrieved from https://doi.org/10.1016/0022-1996(92)90050-T

Zouaoui, A., Arab, M. B., Alamriv, A. M. (2022) "Determinants of corruption in developing countries: case of Tunisia." *Journal of Financial Crime. 29*(1), 2022, 111-127

Zangina, S., & Hassan, S. (2020). Corruption and FDI inflow to Nigeria: a nonlinear ARDL approach. *Journal of Financial Crimes, 27*(2), 635-650. doi:10.1108/JFC-09-2019-0116