The Corruption-Inflation Nexus in Africa

The Case of Ghana

By

Stephen Armah (Ashesi University)

and

Alfred Berkoh (Ashesi University)

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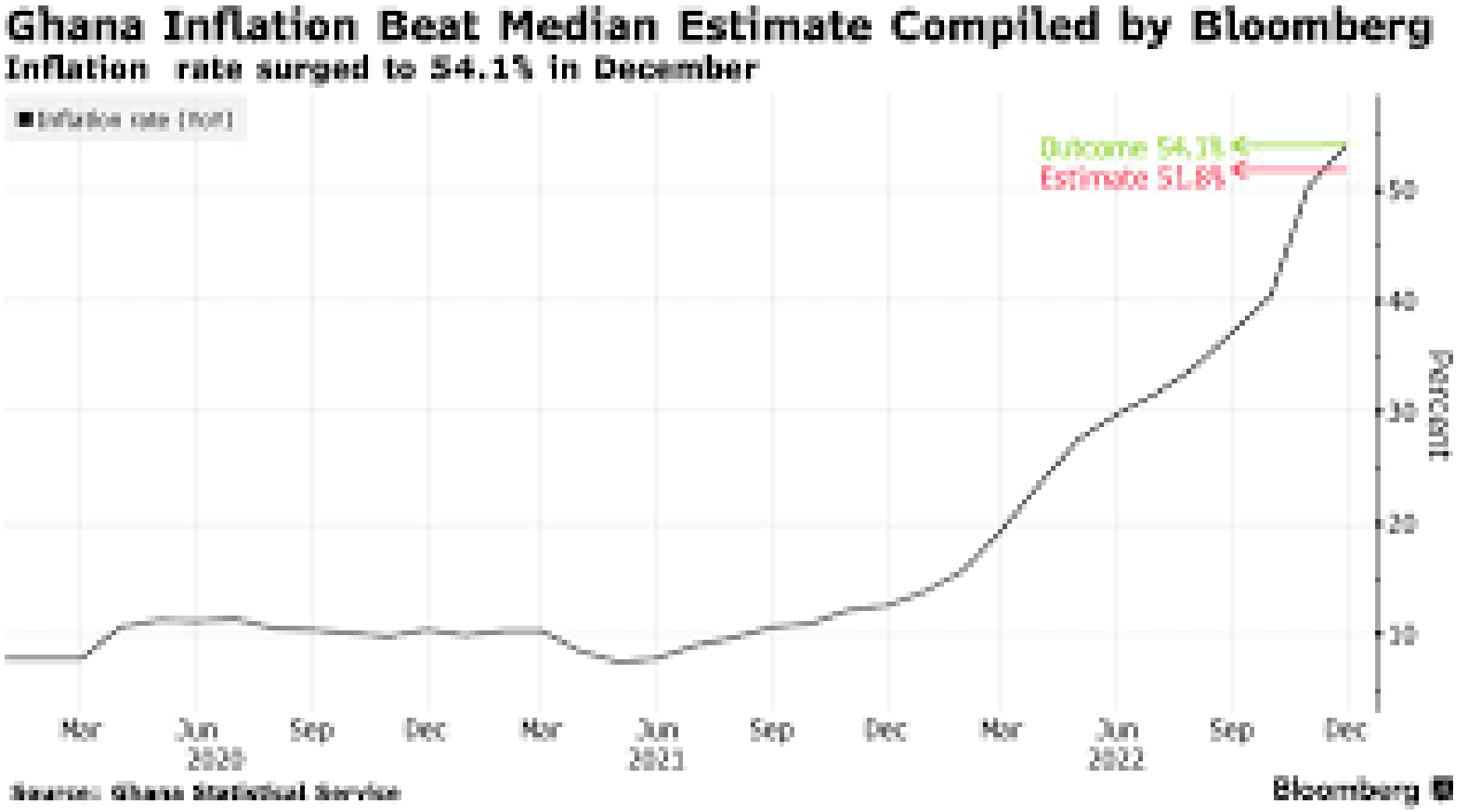


In 2022, Ghana inflation increased from **single digits to over 50%** in less than 7 months
It has remained **between 30% and 50% since then. Inflation is clearly a problem**

THE CEDI IS STRUGGLING - CURRENCY DEPRECIATION: GHC/USD from 2009-2023

Average Cedi depreciation from 2009 to 2023 = (14.356 – 1.4187)/ (1.4187)*100 = 911% depreciation

Average depreciation post COVID in 2020 to 2023 = (14.356 – 5.46)/5.46*100 = 165%

Corruption Perception Index

https://countryeconomy.com/government/corruption-perceptions-index/ghana

This year's CP index includes 180 countries, and the score indicates the perceived level of public sector corruption on a scale of 0-100. 0 means that a country is perceived as highly corrupt and 100 is perceived as very clean. Ghana (43) is tied for 72 cleanest with Bulgaria and South Africa

The Corruption and Inflation Menace

Corruption: A Global Challenge

- Causes wastage of resources and hindrance to development (**Shabbir & Yaqoob 2019**)
- More pervasive in developing nations like Ghana (**Shabir & Anwar 2007**)

Corruption's Impact on African Development

- African countries, including Ghana, are affected the most by corruption (**Gyimah-Brempong 2002)**
- **UN estimates $3.6** trillion global cost of corruption in 2018
- African Union (AU) countries experience 25% GDP loss due to corruption (**Zouaoui et al. 2022)**

Inflation: A complement of Corruption in African Economic Crisis: These 2 (inflation and corruption) occur together. What is the nature of the relationship?

- Inflation is defined as general rise in price level
- Impacts purchasing power, supports political unrest
- Past Ghanaian governments toppled in part due to corruption and inflation (Kwame Nkrumah, Kofi Abrefa Busia, Liman administration)- **"Kalabule", Coups and Executions**

Monetary Authorities and Fiscal Policy in Ghana

- Fiscal authorities influence monetary policy, affecting inflation control
- Deficit financing and money printing exacerbate inflation.
- Inflation undermines the purchasing power of lower level govt officials and makes them corruptible
- **The dilemma of development in many poor countries is that every single infrastructural project is an opportunity for inflating prices for higher level government elites**.
- Printing money and borrowing foreign exchange for private consumption by elites is inflationary
- Expected to be paid by taxing citizens

CORRUPTION IS KNOWN TO BE A PROBLEM

This quote from Abu and Staniewsky (2019) makes the case

Corruption tends to slowdown economic growth via reduction in human capital development in the form less spending on education and healthcare, misallocation of resources, inadequate domestic investment, less provisions of social amenities and transfers to the poor, and high inequality and poverty, among other things (Abu, karim & Aziz, 2015a; Del Monte, & Papagni, 2007; Gupta, Davoodi, & Alonso-Terme, 2002; Gyimah-Brempong, 2002; Gyimah-Brempong & de Camacho, 2006; Habib & Zurawicki, 2001; Mauro, 1995; Mo, 2001; Nguyen & van Dijk, 2012; Wei, 2000).

Example of news from Ghana October 18th 2023: A presidential candidate accuses his own ruling party of engaging in environmentally damaging illegal mining or "*Galamsey*"
https://www.ghanaweb.com/GhanaHomePage/NewsArchive/People-will-run-for-cover-if-I-list-ministers-involved-in-galamsey-Kennedy-Agyapong-1862714?dicbo=v2-dhqXUyK

Research Objectives and Contribution to the Literature

Key Question:
What is the corruption-Inflation Nexus?

Research Gap

- Few studies focus on corruption-inflation nexus for **developing nations** (Uroos et al. 2022)
- Scarce literature on corruption-inflation nexus specifically for Ghana
- **Research on possible asymmetric response of corruption to inflation absent**

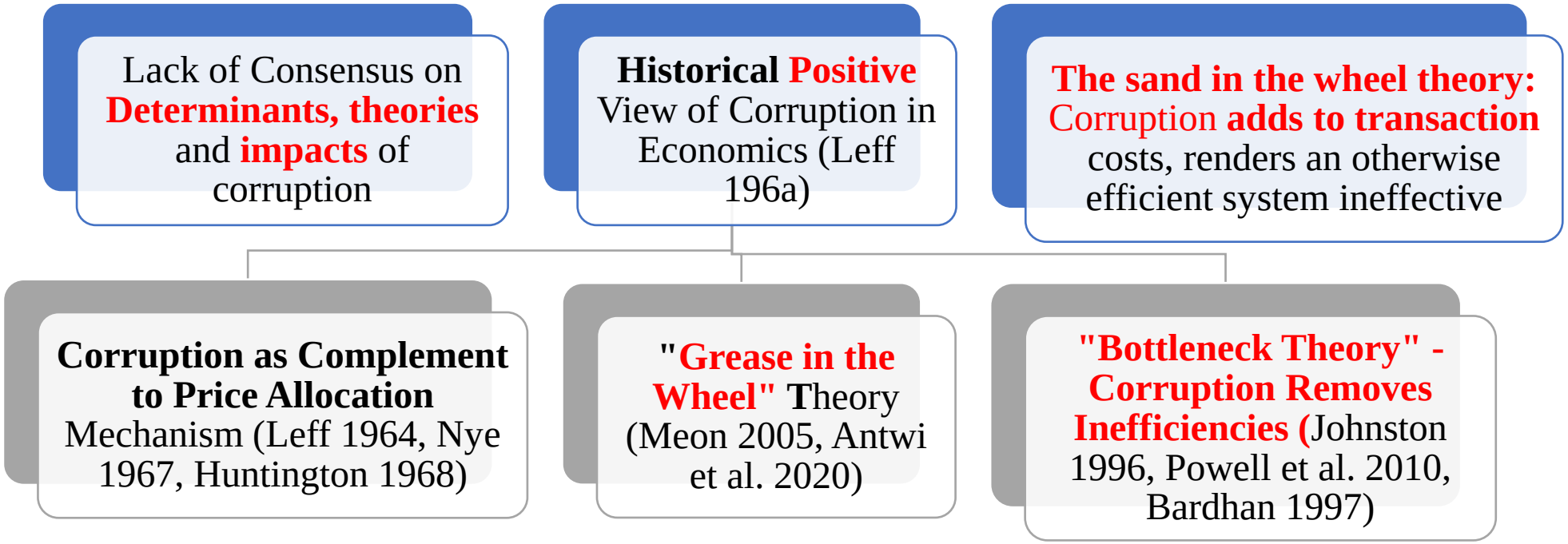
Research Objectives

- To quantify the nature of the inflation-corruption relationship in Ghana
- To adress non-stationarity, asymmetry, and co-integration relationships

Contribution to Literature

- Utilizes recent data to explore corruption-inflation nexus in Ghana
- Rigorous assessment of time series properties.
- Comprehensive cointegration testing, accounting for different orders of integration
- Addresses endogeneity concerns through feedback and other sources
- Investigate non-linearities in corruption inflation nexus

Theoretical Review of Corruption



Why Inflation Can Cause Corruption

According to Sassi and Gasmi (2017) there **are 3 ways by which inflation causes corruption-**

(i) An increase in the generel level of price affects the purchasing power of people, which leads them to resort to illegal and unethical sources of income.

((ii) Second, economic depressions caused by inflation generate a loss of confidence and an ambiguity in the economic sphere, which drives people to engage in speculative behaviour and corruption.

(iii) Third, some political authorities run up seigniorage and debt to finance budget deficit and maintain economic growth instead of taking drastic and potentially painful measures. Inflation caused by high government expenditures and public expenditure composition generates opportunities for lobbying activities and stimulates corrupt behavior

Why Corruption Can Cause Inflation

A**ccording to Sassi and Gasmi (2017)** corruption causes inflation in **4 ways**

(i) First, corruption increases the inflation tax and shrinks the tax base by pushing companies to operate in the informal sector and leading to capital flight, which constrains government to resort to seigniorage.

(ii) Second, bribes are included in the selling price and lead to an increase in the general level of prices.

(iii) Third, corruption induces inflationary forces through higher aggregate demand pressures because it reduces public funds and increases the budget deficit.

(iv) Fourth, by decreasing public incomes, corruption leads governments to increase the volume of public debt, which results in a higher inflation rate

Corruption-Inflation Theoretical Review

Information Theory of Corruption (**Braun & Di Tella 2004**)

- Problems in Information Transmission Incentivize Corruption due to inability to carry out price comparison (Principal, Ghanaians or the government) is at the mercy of the agent (government official)

Empirical Review of Corruption-Inflation Nexus

Mostly Cross-Country Perspective with mixed findings

Limited Research on Single Country Time Series Estimation

Contribution of This Research: Time Series Analysis for Developing Countries

Corruption-Inflation Empirical Review

Inflation causes Corruption from a cross-country perspective

Getz and Volkema, 2001; Braun and Di Tella, 2004

Corruption causes inflation

Abed and Davoodi 2000; Al-Marhubi 2000 and Smith-Hillman, 2007

Method

General Specification

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

ARDL Cointegration Model

Efficient in small sample size

Suitable for variables integrated at different orders

NARDL Cointegration Estimation

Measures asymmetry in relationship

Why ARDL and NARDL

ARDL has 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 integrated of the same order or integrated of different orders**.
- Note: second order integration is not allowed in ARDL analysis (**Pesaran**, **Shin & Smith 2001; Antwi et al, 2020)**.
- There is possible simultaneity between inflation and corruption (**Braun** & **Di Tella, 2004**). Estimation approach must be robust to such simultaneity. 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.

Why ARDL and NARDL

- According to the literature, 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 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 can deal 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:

Method-Model Specification

ARDL Bounds Cointegration

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

ARDL follows Pesaran, Shin and Smith (2001)

NARDL follows Shin, Yu and Greenwood-Nimoh (2014).

• NARDL Bounds Cointegration

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

Findings

ARDL Bounds Test of Cointegration

F-statistic (32) > Upper bound (4.68) for 1% significance.

Variables are cointegrated, justifying Error Correction Model (ECM).

Investigating short and long-run dynamics using ARDL-ECM.

ARDL-ECM Short-Run Dynamics

Inflation is positively related to control of corruption .

Inflation rise decreases corruption; opposite in the long run

Exchange rate is positively related to corruption

ARDL-ECM Long-Run Dynamics

Long-run: Inflation increase significantly increases corruption.

Exchange rate is positively related to control of corruption

ARDL Results

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*

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

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*

Autoregressive Distributed Lag (ARDL) -ECM
ARDL Error Correction Results

Bounds Test Criterion: Reject H0: no cointegration if the F-Statistic > upper bounds of a chosen level. F-statistic obtained = 32, > 4.68 (upper bound for 1% significance Level.

Conclusion: Variables are cointegrated, justifying the use of an Error Correction Model (ECM)

Vector Autoregression

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*

Granger Causality

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

Inflation Granger Causes Corruption

Non-Linear Autoregressive Distributed Lag (NARDL) Results

_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_	-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_	0.124	0.081	1.530	0.176	-0.074	0.322
V&Account	1.117	0.234	4.77	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

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

Bounds test of cointegration:
F-statistic of 14.4 is greater than the upper Bound value of 4.68 due to Pesaran and Shin (1999) and suggested by Shin, Yu and Nimoh, 2014 confirms cointegration in the Prescence of asymmetry

Short run NARDL Results
Increases and decreases of inflation both cause an increase in corruption albeit by different magnitude.

Main Findings

Vector Autocorrelation and Granger Causality

- VAR test confirms negative relation between inflation and control of corruption.
- Granger Causality test indicates causation runs from inflation to corruption.

NARDL Results and Asymmetry

- **NARDL Short-Run**: When Inflation increases, COC reduces by 0.01. Inflation reduces, COC reduces
- Suggestion of asymmetry in inflation-corruption response.
- **Cointegration confirmed:**
- Cointegration F-statistic of 14.4 > upper Bound value of 4.68
- **NARDL Long-Run:** Long-run asymmetry confirmed for inflation-corruption relationship.
  - When Inflation goes up, COC goes up by 0.028. When Inflation falls, COC goes up by 0.021
- Exchange rate has no short or long-run asymmetry with corruption.

Implications and Recommendations

Implications for Ghana

Corruption undermines growth in Ghana.

Increasing inflation exacerbates corruption.

Fiscal and monetary discipline needed to reduce inflation and corruption.

Recommended Actions

Prioritize inflation targeting to reduce corruption.

Replace severe deficit financing with zero financing.

Cautious approach to government expenditure based on oil sector revenues.

Close loop-holes for corruption in political governance and monetary management to reduce both corruption and inflation