

The relationship between the cost of living and food security in developing countries. Evidence from Ghana

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Abstract

Purpose – The aim of the quantity study is to investigate the cost of living and food security nexus in Ghana. Time series secondary quarterly data from 2012Q1 to 2018Q4 were examined.

Design/methodology/approach – The autoregressive distributed lag (ARDL) to cointegration bound test was employed for the econometrics analysis. Time series secondary quarterly data from 2012Q1 to 2018Q4 were examined. Food security data based on the Global Food Security Index score were employed.

Findings – The result revealed that the variables are cointegrated in the long run. The study also revealed that the cost of living worsens food security in Ghana both in the short run and the long run. This could imply that people may not have enough money to afford adequate and nutritious food, which can lead to food insecurity. As the cost of living increases, people may have to spend more of their income on basic necessities such as housing, healthcare and transportation, leaving less money for food. This can result in people choosing cheaper and less nutritious options, or even skipping meals, which can have negative impacts on their health and well-being.

Practical implications – For policy implications, it is recommended that effort should be made by the Ministry of Finance Ghana, financial analysts and other economic agents to stabilize prices of goods and services in the country.

Originality/value – The study is among the few to have investigated the nexus between the cost of living and food security in non-Western economy using the secondary data.

Peer review – The peer review history for this article is available at: <https://publons.com/publon/10.1108/IJSE-04-2023-0309>

Keywords Food security, Cost of living, The income-expenditure theory, ARDL, Ghana

Paper type Research paper

1. Introduction

Food security is a critical concept in the fields of agriculture, nutrition and public health. It refers to the availability, accessibility, utilization and stability of food to meet the dietary needs and preferences of all individuals at all times (Mohamed, 2017). Food security is influenced by various factors, including food production and distribution, economic conditions, climate change, political stability and social factors such as poverty and inequality (Mohamed, 2017). In recent years, food insecurity has become a growing concern globally, affecting millions of people around the world. The COVID-19 pandemic has further highlighted the fragility of food systems, as disruptions to global supply chains, economic slowdowns and job losses have led to increased food insecurity in many parts of the world. The United Nations estimates that nearly 811 million people worldwide were undernourished in 2020, an increase of around 161 million from 2019.

Efforts to address food security have focused on a range of approaches, including increasing food production, improving distribution systems, reducing food waste and



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promoting policies that support access to healthy and affordable food. However, the relationship between the cost of living and food security remains a significant challenge in many parts of the world, particularly in low-income and marginalized communities where access to nutritious food is limited by financial constraints (Miles and Monro, 2021).

The cost of living on the other hand refers to the amount of money needed to sustain a certain standard of living, including the basic necessities of food, housing, healthcare and transportation. It is influenced by various factors, such as inflation, wages, taxes and economic policies and can vary significantly between different regions and countries. Cost of living is a critical issue for many individuals and households, particularly for those with low or fixed incomes (Chakraborty, 2023). Rising costs can lead to financial stress, difficulty in meeting basic needs and increased risk of poverty and economic insecurity (Afonso *et al.*, 2018). In many parts of the world, the cost of living has outpaced wage growth, leading to an affordability crisis for many essential goods and services (Miles and Monro, 2021).

In spite of the potential effect of cost of living on food security, literature is mute on the relationship between the studied variables in Ghana. However, literature on food security in Ghana is rich (Akabanda *et al.*, 2017; Antwi and Lyford, 2021), and there are also studies regarding inflation and other variables in Ghana (see Ibrahim and Alagidede, 2017; Evans, 2022). However, none of the above studies examines the nexus between inflation and food security in Ghana, hence creating a knowledge gap in the literature. The high cost of living, especially in low-income communities, makes it hard for people to afford nutritious food, leading to food insecurity and health issues (Taghizadeh-Hesary *et al.*, 2019). Despite a slight improvement in inflation in Ghana in January 2023, food prices continue to rise, affecting people's ability to access food. Therefore, it's crucial to understand how inflation impacts food security in the country. Thus, the objective of the current study is to investigate the effect of cost of living on food security in Ghana. The hypothesis tested is that the cost of living has a significant effect on food security.

Studying the relationship between the cost of living and food security in Ghana is crucial for advancing the Sustainable Development Goals (SDGs) by 2030. It particularly aligns with SDG 1 (poverty eradication) and SDG 2 (zero hunger) by addressing how high living costs can lead to poverty and hunger (Musa and Basir, 2021). The research can also inform policies for healthier dietary choices, economic growth (SDG 8), reducing inequalities (SDG 10) and responsible consumption and production (SDG 12). In Ghana, where many rely on subsistence farming and informal labor, high living costs can exacerbate food insecurity, impacting vulnerable groups and potentially compromising progress toward the SDGs. The study used time series data to examine this relationship (Sheykhi, 2016). Hence, we employed time series secondary quarterly data on Ghana to ascertain the relationship between the cost of living and food security.

The uniqueness of this study lies in several aspects. Firstly, it stands out as one of the pioneering research endeavors that delve into the correlation between the cost of living and food security within the specific context of Ghana, a nation paradoxically endowed with abundant fertile land. Secondly, it introduces a novel food security index meticulously crafted to capture the nuanced food security in Ghana. Diverging from conventional food security measures, this index takes into careful consideration all four dimensions outlined by the Food and Agriculture Organization of the United Nations (FAO): availability, accessibility, stability and utilization. Thirdly, the study employs the autoregressive distributed lag (ARDL) cointegration bound test approach as an econometric methodology, allowing for a comprehensive exploration of both short-term and long-term linkages between the cost of living and food security. For the purpose of the study, we contextualized cost of living as consumer price index-inflation (Koo *et al.*, 2000; Mawutor *et al.*, 2023).

The remainder of the paper is arranged as follows: literature review in section two, methodology in section three, results and discussion in section four and conclusions and policy implications in section five.

2. Literature review

2.1 Overview of food security and inflation in Ghana

Ghana, formerly known as the Gold Coast, covers 239,535 km² and has a population of over 32 million, making it the second most populous economy in West Africa. Food security and inflation are critical economic indicators in the country. In the first quarter of 2022, 49.1% of Ghanaians, about 15.1 million people, faced food insecurity, which decreased to 42.1% (13 million people) in the second quarter. The Greater Accra Region had the lowest food insecurity rate at 27.2%, while the Upper East Region had the highest at 73.7%. All regions saw a reduction in food insecurity except for the Upper West Region. Severe food insecurity nearly halved between the first and second quarters, with the North East Region having the highest rate at 32.9% and the Eastern Region the lowest at 7.3%. Nine regions reported severe food insecurity rates above the national average. In terms of inflation, Ghana's annual inflation rate slowed to 40.1% in August 2023, the lowest since September 2022 but still significantly above the central bank's target of 6%–10%. This decrease was partly due to the stability of the cedi, leading to softer price increases for both food (51.9%) and non-food items (30.9%). Additionally, consumer prices decreased by 0.2% on a monthly basis in August, reversing a 3.6% increase from the previous month.

2.2 Determinants of food security

Several studies have explored the relationship between the cost of living and food security. Studies by the United States Department of Agriculture (1999) found that low-income households spent a higher percentage of their income on food compared to higher-income households. This indicates that the cost of living, particularly for basic necessities like food, is a more significant burden for low-income households, making them more vulnerable to food insecurity. Another study by Fitzpatrick *et al.* (2021) found that a high cost of living was a significant barrier to food access for low-income households in the United States of America. The study found that households in areas with a high cost of living had lower food security, and the cost of food was a more significant predictor of food insecurity than household income. Leroux *et al.* (2018) reported that food insecurity was more prevalent in urban areas with a high cost of living. The study identified several factors that contributed to high food costs, including limited access to affordable food retailers, high transportation costs and inadequate housing conditions.

Food insecurity was more prevalent among households with a high cost of living in rural areas because the combination of low wages and high living expenses makes it difficult for these households to afford enough nutritious food. In addition, rural areas often have limited access to grocery stores and healthy food options, which can further exacerbate food insecurity. Jernigan *et al.* (2017) in their study found that food insecurity was more prevalent among households with a high cost of living in rural areas of the United States of America. The study revealed that households facing high food costs often have to make difficult choices between food and other essential needs like healthcare and housing. These trade-offs can result in negative consequences such as malnutrition, poor health and unstable housing situations, which can worsen poverty and perpetuate disadvantages. Furthermore, such trade-offs can impact public health, as individuals without access to proper nutrition and healthcare are more likely to face chronic illnesses and require costly medical treatments.

Basu *et al.* (2016) explore the relationship between food prices, access to healthy food and the effectiveness of the Supplemental Nutrition Assistance Program (SNAP) in supporting healthy eating among low-income households. The authors argued that the cost of healthy foods is often higher than the cost of less healthy foods, which can make it difficult for low-income households to afford nutritious meals. It was also identified that low-income households participating in the SNAP may have limited access to healthy food retailers, which can further hinder their ability to acquire nutritious food. The SNAP benefits may not be sufficient to cover the full cost of a healthy diet, particularly in areas with higher food prices. There is evidence that increasing the value of the SNAP benefits could improve the nutritional quality of the foods purchased by the SNAP participants.

According to Chakraborty (2023), inflation can impact food security by making food less affordable for consumers, particularly those with lower incomes, and by reducing the purchasing power of farmers and other food producers. High inflation can also increase the cost of inputs, such as fertilizers and fuel, which can make food production more expensive. Food security is closely related to the quality and security of the food supply, which can be impacted by various factors such as the cost of production, transportation and storage, as well as regulations and policies designed to protect public health (Singh, 2011). However, it is stated in literature that foreign direct investment (Wardhani and Haryanto, 2020), foreign remittances (Moniruzzaman, 2022) and government expenditure (Kamenya *et al.*, 2022) assist in ensuring food security in developing economies.

Darfour and Rosentrater (2016) explore the state of food security in Ghana, with a focus on the agricultural sector. In Ghana, progress has been made in increasing food production and reducing poverty, but challenges remain in achieving food security for all. Smallholder farmers, who form the majority of the agricultural sector, face issues like limited access to credit, low productivity and inadequate infrastructure. Climate change and environmental degradation are major threats to agriculture and food security. Although the Ghanaian Government has implemented policies and programs to promote food security and agriculture, their success has been variable. To enhance food security, improving agricultural productivity and reducing post-harvest losses are essential.

The literature highlights that the high cost of living poses a major obstacle to food access, especially for low-income households, leading to food insecurity. To address this issue, policies aimed at improving access to affordable housing, healthcare and transportation may be crucial in reducing food insecurity and enhancing public health. Therefore, the study's primary focus is to investigate the relationship between the cost of living and food security using time series annual data from Ghana.

2.3 Theoretical framework of the study

We based this study on the income-expenditure theory (IET), a fundamental concept in economics that provides insights into how households allocate their income across various expenses, including the cost of living (Macesich, 1969). This theory suggests that a household's economic well-being and ability to maintain a certain standard of living are determined by its income relative to its expenditures, particularly for essential needs such as housing, transportation, healthcare and food. Central to the IET is the concept of budget constraints. With limited financial resources, households must allocate their income among various needs according to their preferences and constraints. High living costs, driven by factors like housing, utilities and healthcare, can significantly reduce discretionary income available for non-essential spending. The cost of living is a critical factor in this theory, as increases in these costs can lead to trade-offs that negatively impact food security (Hamilton *et al.*, 2019). For instance, rising housing costs might force households to reduce their spending on food, potentially resulting in food insecurity.

When high living costs tighten budget constraints, households often face tough choices, such as buying lower-quality food or skipping meals, thereby compromising their food security. The IET underscores the need to address the cost of living to improve food security and recommends policies that consider economic factors contributing to high living expenses, like housing affordability and healthcare costs. Government interventions that target reducing income inequality, providing affordable housing and ensuring robust social safety nets can mitigate the impact of a high cost of living on food security, especially for vulnerable populations (Nzeyimana, 2021). Thus, applying the IET with a focus on the studied variables is essential for this investigation.

3. Methodology

3.1 Research design and source of data

The study is quantitative in nature, and data on food security were sourced from the Global Food Security Index website, and this includes availability, accessibility utilization and stability. We computed the food security index from these indicators. However, data on cost of living, government expenditure on agriculture, credit to agriculture, household consumption expenditure, foreign direct investment, remittances and fertilizer consumption are all sourced from the World Bank database. The study retrieved annual data for all the studied variables from 2012 to 2018. However, due to limited periods for the data, we converted the data into quarterly series from 2012Q1 to 2018Q4, following Mawutor *et al.* (2023) for the econometric estimations. Thus, the choice of the variables is informed by literature and data availability. Data collected were edited and arranged in Excel before we finally estimated the regressions using EViews 12.

3.2 Model specification

Based on the IET, the model for the study is specified as follows:

$$FS_t = \beta_0 + \beta_1 KL_t + \beta_2 RM_t + \beta_3 FZ_t + \beta_4 CRA_t + \beta_5 EM_t + \beta_6 HC_t + \beta_7 GA_t + \beta_8 FDI_t + \varepsilon_t \dots \dots \dots (1)$$

Where Ln is natural log,

β_0 is the intercept,

$\beta_1 - \beta_9$ are coefficients,

FS_t = food security

KL_t = cost of living

RM_t = foreign remittances

FZ_t = fertilizer consumption (kilograms per hectare of arable land)

CRA_t = credit to the agricultural sector

EM_t = employment in the agricultural sector

HC_t = household consumption expenditure

GA_t = Government expenditure on agricultural

FDI_t = foreign direct investment

ε_t = Error term

The dependent variable in our study is food security. Food security is a multidimensional concept that refers to the availability, accessibility, utilization and stability of food to ensure that all individuals within a population have access to sufficient, safe and nutritious food to meet their dietary needs and preferences for an active and healthy life. We computed the composite index of this variable by using food security indicators, namely availability, accessibility, utilization and stability. Cost of living is our main variable of interest, which is measured as a consumer price index. We expect a negative nexus between the cost of living and food security. Foreign direct investment, remittances, household consumption expenditure, credit to agriculture and government expenditure on agriculture are all controlled for in the study. These variables are measured as a percentage of gross domestic product (GDP). All these variables are expected to have a positive effect on food security. Fertilizer consumption is also used as one of the control variables. We measured this variable as fertilizer consumption (kilograms per hectare of arable land) and expect a direct effect of this variable on food security, and information on the variables is detailed further in [Table 1](#).

3.3 Estimation technique

Based on literature ([Pesaran et al., 2001](#); [Mawutor et al., 2023](#)), the study employed the ARDL method to ascertain the relationship between circular economy and carbon emissions in Ghana. The ARDL method was employed because it is simple and guarantees a flexible framework for dynamic data modeling ([Bårdsen, 1989](#)). The study further relied on this approach because, unlike other multivariate approaches, this approach is suitable and provides robust results when the sample size is small, and it is also suitable if the variables are

Variables	Measurement	Expected sign	Sources
Food security (FS)	Food security index score Accessibility Stability Utilization Availability	N/A	Global Food Security Index
Cost of living (KL)	Consumer price index (Koo et al., 2000)	–	World Development Indicators (WDI)
Remittances (RM)	Personal remittances received (% of GDP) (Chiodi et al., 2012 ; Jokisch, 2002 ; Moniruzzaman, 2022)	+	World Development Indicators (WDI)
Fertilizer consumption (FZ)	Fertilizer consumption (kilograms per hectare of arable land) (Stewart and Roberts, 2012)	+	WDI
Credit to agriculture	Credit to agriculture (% of GDP)	+	WDI
Employment in agriculture	Employment in agriculture (% of total population) (Antwi and Lyford, 2021 ; Turvey, 2017)	+	WDI
Household consumption expenditure (HC)	Household consumption expenditure (% of GDP) (Antwi and Lyford, 2021)	+	WDI
Government expenditure on agriculture (GA)	Government expenditure on agriculture (% of GDP)	+	WDI
Foreign direct investment (FDI)	Foreign direct investment flows (% of GDP) (Kamenya et al., 2022)	+	WDI

Table 1.
Definition of variables

Source(s): Authors' estimation, 2023

integrated at different orders. The importance of ARDL over other multivariate approaches, such as those by [Engle and Granger \(1987\)](#) and [Johansen and Juselius \(1990\)](#), as observed, is that ARDL employed a robust strengthened method that allows different lags to be included for the model estimation ([Pesaran et al., 2001](#)).

3.4 Cointegration analysis

To ascertain cointegration of the variables, the study modeled the following ARDL equation.

$$\begin{aligned} \Delta FS = & \beta_0 + \sum_{i=1}^p \beta_1 \Delta FS_{t-i} + \sum_{i=1}^p \beta_2 \Delta KL_{t-i} + \sum_{i=1}^p \beta_3 \Delta RM_{t-i} + \sum_{i=1}^p \beta_4 \Delta FZ_{t-i} \\ & + \sum_{i=1}^p \beta_5 \Delta CRA_{t-i} + \sum_{i=1}^p \beta_6 \Delta EM_{t-i} + \sum_{i=1}^p \beta_7 \Delta HC_{t-i} + \sum_{i=1}^p \beta_8 \Delta GA_{t-i} \\ & + \sum_{i=1}^p \beta_9 \Delta FDI_{t-i} + \lambda_1 FS_{t-1} + \lambda_2 KL_{t-1} + \lambda_3 RM_{t-1} + \lambda_4 FZ_{t-1} + \lambda_5 CRA_{t-1} \\ & + \lambda_6 EM_{t-1} + \lambda_7 HC_{t-1} + \lambda_8 GA_{t-1} + \lambda_9 FDI_{t-1} + \mu_t \dots \dots \dots \end{aligned} \quad (2)$$

Thus, Δ is the first difference operator, μ_t denotes the error term and the variables FS, KL, RM, FZ, CRA, EM, HC, GA and FDI denote food security, cost of living, foreign remittances, population growth, credit to the agricultural sector, household consumption expenditure, government expenditure on agriculture and foreign direct investment, respectively, and λ captures the long-run nexus. The model captures trend in time in the variables to ascertain the autonomous volatility in time. In the event of evidence of a long-run nexus among the variables, the error correction model (ECM) would be estimated as follows:

$$\begin{aligned} \Delta FS = & \beta_0 + \sum_{i=1}^p \beta_1 \Delta FS_{t-i} + \sum_{i=1}^p \beta_2 \Delta KL_{t-i} + \sum_{i=1}^p \beta_3 \Delta RM_{t-i} + \sum_{i=1}^p \beta_4 \Delta FZ_{t-i} \\ & + \sum_{i=1}^p \beta_5 \Delta CRA_{t-i} + \sum_{i=1}^p \beta_6 \Delta EM_{t-i} + \sum_{i=1}^p \beta_7 \Delta HC_{t-i} + \sum_{i=1}^p \beta_8 \Delta GA_{t-i} \\ & + \sum_{i=1}^p \beta_9 \Delta FDI_{t-i} + \delta ECM_{t-1} \\ & + \mu_t \dots \dots \dots \end{aligned} \quad (3)$$

Where δ denotes the speed of adjustment to ascertain the shock in the event of disequilibrium in the model and ECM_{t-1} accounts for the residual derived from modeled [equation \(1\)](#). Thus, the F-statistic value is contingent on the number of lags of the variables used in the model estimation to the differentiated variables. The derived value of the F-statistic is required to be compared with the upper bound critical value. In the event where it is greater than the upper bound critical value, we can conclude that there exists a long-run relationship among the variables. If the value of the F-statistic is lower than the lower bound critical value, we assume that there is no cointegration among the variables. However, where there is inconclusiveness regarding the level of cointegration, it will be imperative to test for error correction terms to ascertain cointegration ([Banerjee et al., 1998](#)).

4. Results and discussions

From the descriptive statistics ([Table 2](#)), the standard deviation of food security, foreign remittances, government expenditure on agriculture, fertilizer consumption and foreign direct investment are closer to their respective means. On the other hand, the standard deviation of the other variables such as cost of living, employment in the agriculture sector, credit to agriculture and household consumption expenditure was found to be quite far from their individual mean. Consequently, a change in the diverse values significantly affected the intending year's value. These excessive fluctuations make prediction much less positive.

Observation of the minimum and maximum values show there are variabilities in all data units. In addition, despite a relatively higher mean values for household consumption expenditure and employment in the agriculture sector are robust for the economy, such cannot hold for the cost of living.

In the first example, the potential unit root trouble is checked through Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) test. Although the ARDL approach does not require the pre-testing of unit root problem, it is miles nevertheless crucial to carry out the aforementioned exams to make sure that none of them are integrated of an order greater than one. Both ADF and PP tests are implemented to levels and first difference simultaneously (Table 3). The outcomes have confirmed that each one of the variables are non-stationary at levels except for foreign remittances and credit to the agriculture sector. However, the rest of the variables became stationary after first difference. Thus, the study concludes that the variables are integrated at different orders.

The outcomes for the Wald *F*-test in conjunction with critical values taken from Narayan (2004) are suggested in Table 4. The calculated Wald *F*-test is 3.83 – higher than the upper bound critical values at 1%, 5% and 10% levels of significance. Therefore, we concluded that our variables are cointegrated.

Table 2.
Descriptive statistics

Variables	FS	KL	RM	FZ	CRA	EM	HC	GA	FDI
Mean	0.56	46.54	1.39	11.27	5.10	52.36	1.33	3.52	0.24
Maximum	0.62	232.25	10.13	37.15	18.80	56.97	4.59	12.21	2.25
Minimum	0.48	0.04	0.01	2.70	0.40	33.86	3.34	0.51	–2.99
Std. Dev	0.03	62.69	2.32	9.50	3.28	7.11	1.35	2.89	1.61

Source(s): Authors' estimation, 2023

Table 3.
Unit root test result

ADF@5%	Levels	First difference	Order of integration	Lag length
FS	–2.56	–6.00	I(1)	1
KL	–1.15	–5.53	I(1)	1
FZ	–1.25	3.46	I(1)	1
RM	–3.54	–3.57	I(0)	1
CRA	–5.24	–5.20	I(0)	1
EM	–2.57	–4.76	I(1)	1
HCE	–1.30	–4.94	I(1)	2
GA	–1.81	–6.45	I(1)	2
FDI	–1.61	–6.29	I(1)	1
<i>PP@5%</i>				
FS	–2.73	–6.28	I(1)	1
KL	–1.12	–5.52	I(1)	1
FZ	–1.23	–4.01	I(1)	1
RM	–5.60	–3.57	I(0)	1
CRA	–5.23	–12.53	I(0)	1
EM	–2.21	–4.12	I(1)	1
HC	–1.63	–5.00	I(1)	2
GA	–1.74	–6.29	I(1)	2
FDI	–1.850	6.29	I(1)	1

Source(s): Authors' estimates, 2022

Based on the long-run nexus between the cost of living and food security, the long-run coefficient was estimated, and the results are shown in Table 5. From Table 5, the coefficient of cost-of-living proxy as inflation is negative and statistically significant at 1%. This implies that with 1% increase in cost (inflation), food security will worsen by 1.92%. This is real because the cost of living (inflation) results in a corresponding increase in the general level of goods and services as well as induce the real value of wages, which leads to poor standard of living for the people (Agarwal and Kimball, 2022). It could also imply that people may not have enough money to afford adequate and nutritious food, which can lead to food insecurity. As the cost of living increases, people may have to spend more of their income on basic necessities such as housing, healthcare and transportation, leaving less money for food. This can result in people choosing cheaper and less nutritious options or even skipping meals, which can have negative impacts on their health and well-being. Additionally, food prices can be more volatile than other goods, meaning that sudden increases in the cost of living can have a disproportionate impact on food security. Hence, the hypothesis that the studied variables are significantly related is accepted.

The results also show that 1% increase in fertilizer consumption will boost food security by 2.94%, and this is statistically significant at 1% and is consistent with the results of Stewart and Roberts (2012). Thus, the positive effect of fertilizer consumption on food security is due to its ability to increase agricultural productivity and crop yields, improve crop quality and contribute to the sustainable intensification of agriculture, which can help to meet the growing demand for food while preserving natural resources and ecosystem services (Stewart and Roberts, 2012).

Foreign remittances flow has a positive and significant impact on food security with a coefficient of 1.22. This ascertains the dynamic reaction of output from variations in foreign remittance flows. The results imply that 1% increase in foreign remittances induces food security by 1.22%, keeping other factors constant. This outcome collaborates with literature (see Chiodi *et al.*, 2012; Moniruzzaman, 2022; Jokisch, 2002).

Also, credit to agriculture sector has a positive and significant effect on food security with the period of the study. Improve credit to the agriculture sector assists farmers to acquire

F-statistics	Lower bound	Upper bound	K (n-1)	Sig. level	Remarks
3.83	1.85	3.15	7	10%	Cointegration
	2.11	3.42		5%	
	2.62	3.77		1%	

Source(s): Authors' estimates, 2023

Table 4.
Cointegration test
result

Variables	Coefficients	Std. Error	t-statistics	p-values
KL	-1.52	0.15	9.93	0.00
RM	1.22	0.32	3.77	0.00
FZ	2.94	1.16	2.53	0.03
CRA	4.13	0.63	6.54	0.00
EM	0.08	0.11	0.10	0.22
HC	4.30	0.16	27.71	0.00
GA	0.18	0.13	1.36	0.12
FDI	1.90	0.13	14.29	0.00

Source(s): Authors' estimation, 2023

Table 5.
Results of estimated
long-run coefficients

inputs including seeds, fertilizers, plants and other needful inputs. In the absence of own savings, credit from financial institution is an alternative source of finance for farmers. The results indicate that an increase in credit to agriculture will induce food security by 4.13%. This confirms with previous study (Antwi and Lyford, 2021; Turvey, 2017). Hence, frantic effort must be made to increase credit to farmer to improve productivity of the sector. This will help to ensure availability and accessibility of food in the country.

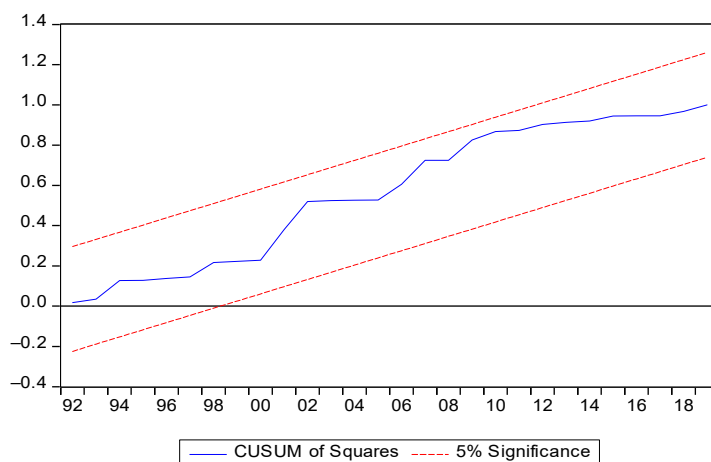
Household consumption has a positive and significant effect on food security, and this is consistent with literature (Antwi and Lyford, 2021). The results further indicate that employment in the agriculture sector which proxy labor supply in agriculture and government expenditure on agriculture are not stimulants of food security in the country. Even though these variables are positive, they are not significant in inducing food security, contrary to the results of Kamenya *et al.* (2022). Finally, foreign direct investment produced a positive and significant effect of (1.90 with a t-statistics of 14.29) on food security, and this is consistent with literature (Wardhani and Haryanto, 2020).

The study further estimated the short-run coefficients, and Table 6 contains the results. Based on Table 6, the coefficient of cost of living is negative and statistically significant at 5%. Thus, an increase in inflation worsens food security in the country. The result indicates that 1% increase in the cost of living worsens food security by 2.45% all things remaining unchanged. The study also undertook post-estimation tests to ascertain robustness of the results. Some of this test includes normality, serial correlation and heteroskedasticity. According to the results, the model is free from constrains such as serial correlation and heteroskedasticity because the results failed to reject the null hypothesis, as shown in Table 6. Further, the model is normally distributed as indicated by the probability value of the normal distribution test. Finally, stability test was used to verify whether the model is statistically stable over time. Hence, the study used Cumulative Sum of Squares test (CUSUMSQ) as suggested by Brown *et al.* (1975) to check for the stability of the model. The plot of the CUSUMSQ lies within the 5% critical value of significance, as indicated in the graph in Figure 1. This suggests that the model is stable over time.

Table 6.
Results of estimated
short-run coefficients

Variables	Coefficients	Std. error	t-statistics	p-values
FS	2.02	1.32	1.52	0.13
KL	-2.45	0.16	15.23	0.07
RM	2.16	1.03	2.10	0.02
FZ	2.61	0.81	3.22	0.00
CRA	3.16	2.22	1.42	0.31
EM	3.25	1.83	1.77	1.12
HC	3.12	2.13	1.47	0.13
HC(-1)	1.25	1.16	1.07	0.12
GA	2.16	1.02	2.11	0.21
GA(-1)	0.07	0.11	0.63	0.21
FDI	3.13	1.82	1.72	0.07
ECM(-1)	-0.23	0.11	2.05	0.03
R-square	80.98			
Adjusted-R-square	76.34			
F-stat	14.65			
F-stat.(prob)	0.000			
Serial Correlation	1.200			
Heteroskedasticity	0.590			
Normality	1.23			

Source(s): Authors' estimation, 2023



Source(s): Authors' Estimation (2023)

Figure 1.
CUSUMSQ

In addition, as unchanged with the long run, foreign remittances and foreign direct investment produced a positive and significant effect on food security at a 5% level of significance, and this collaborates with literature (Moniruzzaman, 2022). Thus, a 1% increase in foreign remittances results in 2.16% and 3.13% increases in food security in the short run, holding other variables constant. Consistent with long-run results, fertilizer consumption has a positive and statistically significant effect on food security in the short run. Thus, a 1% increase in fertilizer consumption triggers an increase in food security by 3.13%.

The coefficient of the error correction term ECM (-1) is negative and statistically significant at 5%. The sign of the error correction term validates the assertion of the presence of long-run cointegration among the variables in the study. Thus, the coefficient of 0.23 suggests that disequilibrium in the long run as a result of shocks in the short run is corrected at an adjustment speed of 23% on yearly basis.

4.1 Conclusion

In conclusion, the study provides a significant contribution to the bigger comprehending of the effect of cost of living (inflation) on food security in a non-Western economy context. Further, the study managed to reveal that an increase in inflation dwindles food security. The current study provides a significant contribution that fills the gap in extant cost of living–food security nexus literature. One, our analysis has agreed to the research call in updating known literature, which is evidence in the enhancement of our understanding of the role that cost of living plays and its influence on food security. This is relevance in drafting food security policy strategies and plans. Two, the study specifically investigated a country-specific inflation perspective on food security employing quantitative data using the ARDL cointegration bound test approach. Three, in line with the argument of IET, our results contribute to known literature by highlighting the relevance of the cost of living on food security in the Ghanaian context.

4.2 Policy recommendations

4.2.1 Theoretical implication. Categorically, the study relied on the IET to investigate the cost of living and food security nexus in Ghana. In spite of the fact that the Income and Expenditure Theory has been used in literature by past researchers of food security, the literature from a non-

Western economy perspective food security remains dubious. As such, the application of the IET from the non-Western country perspective remains as one of the main theoretical implications of the study. Two, the IET was applicable as well as necessary in ascertaining the effect of the studied variable on the cost of living and food security nexus in Ghana. This is evident in how the studied variable influences food security in Ghana. Amazingly, majority of the previous studies failed to consider the effect of the cost of living on food security in Ghana, thus creating a knowledge gap in literature. The current study closed this gap by making the first attempt to extend the understanding of cost of living as a major predictor of food security from a non-Western country perspective. Thus, the current insight will assist economic policy formulation that enhances food security in this context as well as similar geographical environments.

4.2.2 Policy recommendation. The relationship between the cost of living and food security has a strong policy implication for the Ghanaian Government, the Ministry of Finance and Economic Planning, the Bank of Ghana, financial analysts and other policymakers. Stability in growth is relevance for achieving sustainable development. However, variabilities in the prices of goods and services develop an environment of uncertainty, which is not attractive to propel development venture. Increase in inflation often leads to an increase in the prices of goods and services, including food. This can make food more expensive, reducing the purchasing power of consumers, particularly those with limited financial resources. Higher food prices can also lead to a decrease in food accessibility, making it harder for people to obtain the food they need to maintain their health and well-being. The study recommends that governments should implement price stabilization measures to mitigate the impact of inflation on food prices. For example, governments can provide subsidies to farmers or regulate prices to keep them stable. Inflation can affect the supply chain of food, leading to a reduction in food availability, and inflation can increase the cost of transportation and storage, which can lead to reduced food availability in certain areas.

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