

THE COMPLEMENTARY IMPACT OF UNEMPLOYMENT AND INFLATION ON LITERACY IN WEST AFRICA FROM 2000 TO 2023: EVIDENCE FROM PANEL ARDL

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Abstract

This study observes the complementary impact of unemployment and inflation rate on human capital education in 15 West African countries from 2000 to 2023. Education is proxied by literacy rate as a regressor against the selected macroeconomic environment. A Panel ARDL technique was adopted along Bounds test, Granger causality, and Impulse Response Function on data set of 358 observations for each variable employed. The study then, rooted in a three-pronged theoretical framework of Uzawa's Two - Sector Model of Human Capital Accumulation, Classical Theories of Labour & Price Stability, and Human Capital Theory. The findings disclose that in the short run, unemployment, inflation, and their interaction have insignificant relationships with education (literacy). In the long run, unemployment (-0.253281 ; $p= 0.0000$) and inflation (-0.194927 ; $p= 0.0000$) has individually reduced literacy outcomes but credit to the private sector positively expands education outcomes. The interaction term is positively significant (0.037879 ; $p= 0.0000$), indicating that households adapt by reallocating time to education under stagflation to hedge human capital idleness. And lastly, a long-run cointegration occurs only in Cape Verde and Ghana out of 15 West African countries. On that note, the study concludes that macroeconomic instability coerces literacy and induces 'JAPA syndrome' in West Africa. But its joint effect triggers adaptive education investment. Therefore, policy should combine price stability, job creation, credit expansion, and education quality reforms to sustain human capital expansions and restrain mass skilled migration termed 'JAPA syndrome' in West Africa.

Keywords: Unemployment; Inflation; Literacy; Human Capital; West Africa; Panel ARDL

JEL Classification: I25; E24; E31; O15; C23

1. Introduction

Human capital is a critical driver of economic development, with education forming its central component. Education equips individuals with knowledge and skills, enriches labour productivity, and nurtures innovation necessary for sustained growth (Barro, 2001). Countries that have higher levels of educational achievement experience faster rates of development and more effective poverty reduction. In West Africa, however, the potential of education to catalyse growth remains largely underutilised. Despite various national and regional policies aimed at improving educational outcomes, the West Africa region continues to record low literacy rates, weak Human Development Index (HDI) values, and persistent human capital flight, popularly termed the 'JAPA syndrome'. This paradox persists against a backdrop of prolonged macroeconomic volatility characterised by high unemployment and double-digit inflation rates. Unemployment in West Africa averaged 4.6% in 2023, while 29% youth aged 15–24 were not in employment or education/ training.

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The average West African unemployment happens to be higher than the African (26.1%) and global (23.5%) averages (UNECFA, 2023). Persistent double-digit inflation has eroded real incomes, public education spending and weakening literacy rates across the region. Rising unemployment reduces household enlargement, limits the ability of families to invest in education, and diminishes incentives for skills acquisition. Alongside, inflation forces households to prioritise basic consumption over educational expenditures.

The combined effect constrains government fiscal space for education financing, resulting in underfunded adult literacy programmes, inadequate infrastructure, and poor learning outcomes. Subsequently, human capital flight has extended as expert and unexperienced labour migrate in search of greener pasture not available nationally. Hence, the disequilibrium between macroeconomic environments and human capital development outcomes weakens ECOWAS goals for quality education, and decent employment. The interaction between unemployment and inflation offers a double restraint on human capital education in West Africa. Yet both variables have been studied individually, few empirical attention has been drawn from their joint effect on literacy and educational attainment. Human development indicators for West Africa featured among the lowest worldwide, with education outcomes reproducing deep structural deficits. Following the United Nations Development Programme (UNDP, 2023; 2024), all West African Countries (WACs) remain as the Least Developed Countries (LDCs). The outlook that reflects low educational attainment, poor school enrolment ratios, and sub-optimal literacy rates. Aside the low-key enrichments since 2000, the region's average adult literacy rate in 2022 stood at about 46.5% against the global average of 86.8% (UNESCO, 2023). Primary school enrolment witnessed increase, still the degree of completion and transition to secondary education sustain weak. In 2021, the gross secondary enrolment ratio for Sub-Saharan Africa stood at 43% having many West African states recording statistics less than 40% (World Bank, 2023). Tertiary enrolment was short fall of 10% in almost countries thereby delimiting the supply of skilled and employability of labour. Gender and rural-urban inequalities further exacerbate inconsistencies in access to education.

The inability to replicate the developmental gains of 'Asia Tigers' upon the various ECOWAS visions, macroeconomic and human capital development policies and struggles stands as an aberration in the history of West Africa. Volatility in unemployment and inflation exhibits nonstop control on investment and consumption in human capital development. Prolonged unemployment and inflation have reduced the returns to education and the real value of education expenditure, contributing to low literacy rates, and living standards. The region's inability to surpass the 2019 HDI threshold reflects this gap (UNDP, 2024; World Economic Outlook, 2023). Existing studies have assessed macroeconomic variables and human capital development independently, frequently using OLS or ARDL in single-country contexts (Maku et al., 2019; Ogunjobi et al., 2022; Abamara et al., 2024). Few have examined the complementary effect of unemployment and inflation on literacy, using panel data for West Africa. This gap is significant because policy responses that treat unemployment and inflation in isolation may berate their joint effect on human capital education from 2000 to 2023. Given this problem, the study seeks to answer the question:

What is the complementary impact of unemployment and inflation rate on the literacy rate in West Africa from 2000 to 2023? To guide the study, a tested hypothesis is proposed that there is no complementary impact of unemployment and inflation rate on the literacy rate. This reveals how dire macroeconomic variables is to human capital development policy in West Africa. The rest of this paper covered Section 2- the literature reviews and gap, Section 3- the methodology and theoretical background, Section 4- the regression results and Section 5 – the results analysis, conclusions and policy recommendations.

2. Literature Review

This section presents the conceptual, empirical review and gaps from the literature examined.

2.1 Conceptual Review

2.1.1 Human Capital Education: Education is a fundamental index for measuring individual benefits, economic development and poverty reduction across the globe. It also calms down labour market mismatches through skills acquisitions. For example, Ghana's investment sustainability in education earn her enlargements in literacy rates, educational attainment, and human capital stock that transformed her economic growth and development (World Bank, 2020). West African Public expenses on education averaged 3.8% of GDP from 2000 to 2022 which is lower than the UNESCO-recommended standard of 4 to 6% and inadequate to address infrastructural shortfalls, teacher shortages, and learning quality (UNESCO, 2023). The cumulative result of these challenges is evident in the region's Human Development Index (HDI), with Niger, Mali, and Chad residing in the lowest global positions in 2022 (UNDP, 2023).

2.1.2 Macroeconomic Environment: Unemployment and Inflation

Macroeconomic environment shapes human capital education outcomes. Employment stability develops income accumulation, empowering households to invest in education. From a macroeconomic perspective, a rise or persistent unemployment provides a network for inflation to interject the chances of human capital education for skills acquisition and welfare development (Paul & Bei Liao, 2021). Consequently, at both nation and regional levels families may prioritise basic necessities over investments in education. Thereby leading to lower school enrollment, increased dropout rates, and reduced human capital formation, especially among vulnerable people (African Development Bank, 2023). Youth unemployment allied with increased poverty and crime rates (International Labour Organisation, 2020). Signifying devastated HDI diffusion that aligned with the depression in the standard of living witnessed across the West African region (West African Outlook, 2023).

2.2 Macroeconomic Performance: Dynamics of Unemployment and Inflation across West Africa from 2000 to 2023

The West Africa macroeconomic outlook from 2000 to 2023 is evident by persistent volatility in unemployment and inflation emerging as twin checks on real income value, job creation, and both public and private capacity to fund human capital education. Though the

region documented incidents of growth in the commodity booms of the 2000s and early 2010s, structural flaws in price stability and labour absorption have subdued sustainable development. Joblessness among youth structurally averaged 13.4% from 2000 to 2023, with underemployment exceeding 25% in the region reflecting the outlook of International Labour Organisation (2023). Weak industrial and tax base desired for public education developments, skills gaps, and rapid population growth have continual slack labour market alongside household income accumulation and investment in education. Similarly, regional inflation averaged 8.2%, fluctuating between 6.5% and 9.8% due to exchange rate depreciation, fiscal deficits, and supply-side bottlenecks (AfDB, 2022). These trends destabilised real incomes and educational investment since 2000 to 2019. Afterward in 2020 external shocks intensified pressures. Average inflation rose from 10.3% to 12.8% from 2021 to 2022, compelled by pandemic-related supply disturbances and the Russia-Ukraine conflict, which elevated global energy and food prices (AfDB, 2023; West African Outlook, 2023). Projections indicated a marginal moderation to 11.0% in 2023, with a potential return to single digits at 7.1% in 2024. Differences across monetary blocs persist, West African Economic and Monetary Union (UEMOA) inflation drop from 7.2% in 2022 to 4.7% in 2023, hitherto remained above the convergence threshold of 3.0%. The West African Monetary Zone (WAMZ) average inflation reaching 19.7% in 2022. Replicating currency depreciation in Nigeria and Ghana and high food imports (WAMZ, 2022).

2.3 Empirical Review and Gap in the Literature

Present empirical studies on unemployment, inflation, and education in Africa offer diverse but instructive outcomes, underscoring the requisite to study how their complementary effect interacts with human capital education in West Africa. Adjei-Mensah (2023) observed Ghana using GLSS data and found that youth unemployment decreases secondary school completion due to low perceived returns on education. Similarly, Ozturk (2021) for 42 Sub-Saharan African (SSA) countries reported that a 1 percent upsurge in unemployment shrinks tertiary enrolment by 0.4 percent due to the stronger economies effect on large informal labour markets. When they used panel GMM to examine the relationship between labour market conditions and schooling, the “discouraged worker-student” effect was confirmed. Okunade (2020), using ARDL for Nigeria, 1990–2019, also established that unemployment significantly diminishes literacy rate. At the regional level, Bibi, Khan and Rashid (2022) explored 15 ECOWAS countries and exposed that high youth unemployment drops adult literacy, with the effect magnified for females. ILO (2023) further recognised that prolonged unemployment lowers the incentive to remain in school across West Africa.

Afonso and St. Aubyn (2006), applying cross-country analysis to developing countries, concluded that inflation above 10% significantly reduces public education spending efficiency. Omodero (2019), using Nigerian data, 1981–2017, found that high inflation erodes household real income and education expenditure, causing lower literacy gains. UNECA (2023), in the Economic Report on Africa, affirmed that inflation volatility is a primary determinant of low adult literacy in West Africa. International Monetary Fund (2021) reported that countries with average inflation >15% experienced a 6.2% decline in primary completion rates between 2010 and 2020. Olayemi (2024), for 12 WAMZ

countries, showed that inflation volatility reduces literacy more than inflation level because uncertain prices discourage long-term human capital investment.

World Bank (2020) recounted that stagflation incidents in SSA lessen human capital accumulation through condensed financial space and enlarged household predisposition. ECOWAS Commission (2022), in Vision 2050, admitted that over 30% of West Africans are either out of school or receive insufficient education content for employment because of macroeconomic shocks. Abamara, Eze and Nwosu (2024), using Panel ARDL for 15 ECOWAS countries, established that unemployment and inflation independently have asymmetric negative effects on human capital development, but their joint effect is positive and insignificant. Card and Lemieux (2001), for the U.S., established that college enrolment upswings in recessions as the opportunity cost of schooling drops. Dellas and Sakellaris (2003), worked on U.S. CPS data, confirmed that unemployment increases schooling among males aged 18-24, and termed it as “human capital hedge”. Syafri and Handayani (2022), reported for Indonesia that the interaction of unemployment and inflation is positive but insignificant for literacy. And that stagflation can trigger education investment when job predictions are weak. These outcomes support the likelihood of a positive interaction in developing environments. Methodologically, studies that used Panel ARDL for human capital in West Africa are scarce but growing. Kia, Aminu and Raji (2021) used P-ARDL and discovered that macroeconomic instability decreases education outcomes but access to funding extend education in the long-run.

From the above few studies, three gaps are identified. One, most studies highlight unemployment and inflation separately against their complementary interaction as a basic influencer of education. Two, some findings are rather uneven across the region or methods. This confines the extent to which persistent stagflation in ECOWAS states is generalized. Three, other studies modeled the interactive term on literacy in West Africa using Panel ARDL with country-specific Bounds tests. More importantly, no study has directly relate the interaction effects to the adaptive “human capital hedge” (Gal et al. (2024) and “JAPA syndrome” in the region. To address these gaps, this study is embarked upon in 15 West African countries from 2000 to 2023, using Panel ARDL, Bounds test, Granger causality, and Impulse Response Function to account for both short and long-run dynamics as well as the differences across countries.

3. Methodology

3.1 Theoretical Framework and Model Specification

This study is entrenched in a three-pronged theoretical groundwork of Uzawa's Model of Human Capital Accumulation (1965), Classical Theories of Labour and Price Stability, and Human Capital Theory of Gary Becker (1962) and Schultz (1961). Uzawa's model offers the core mechanism by treating education as a distinct capital - forming sector (the Structural-Absorption Network) through which households assign time between existing production and education. On the ground that the percentage of human capital accumulation is endogenously determined by prevailing economic conditions. At labour market disequilibrium (unemployment) and inflation periods, once the opportunity cost for

schooling drops, more time is allotted to education. When it rises, accumulation drive noses, causing literacy responsive to labour market and price dynamics. In West Africa, persistent unemployment and inflation reduce domestic returns to education, thereby accelerating “JAPA syndrome”. Classical theory complements this assertion by attesting that steady employment and prices are preconditions for sustained investment in human capabilities. Smith's division of labour associates skill creation to productivity though the Classical subsistence-wage opinion (Price-Signal Network). Indicating that inflation erodes real household incomes and capacity to investment in education on the fact that price instability and involuntary unemployment distort inducements to invest in skills acquisition.

Conclusively, the Human Capital Theory postulated by Becker and Schultz that investments in education augment knowledge, skills, and productivity leading to long-run economic growth. On the account that the gains on education are sensitive to the prevailing macroeconomic environment. In periods of instability, the value of human capital investment is battered and erodes, which declines inducements to amass skills and talents because the expected returns on education become low. Conversely, the interactive term of unemployment and inflation may hasty an adaptive reaction: when labour market chances are scarce, the opportunity cost of time drops, pressuring households to reallocate time to education as a long-run hedge against instability. Accordingly, unemployment and inflation individually constrain literacy, their interactive effect can be positive, makes education a rational alternative to idle labour. Following this perceptive and Abrha and Weldeyohans (2025) with a lean disparity, the study postulates a Panel ARDL model to experiment the interaction of unemployment and inflation on literacy in 15 West African countries from 2000 to 2023. The baseline empirical model is stated as:

$$LITR_{it} = \beta_{0it} + \beta_1 SAV_{it} + \beta_2 UEMP_{it} + \beta_3 INFR_{it} + \beta_4 CPS_{it} + \beta_5 UNEM*INFR_{it} + \beta_6 INTR_{it} + \beta_7 EXR_{it} + \mu_{it}$$

(1) Where: $LITR_{it}$ is literacy rate connotes the share of people aged 15+ and above with the ability to read and write, proxy for human capital education in country i at time t . Similarly regarded as the dependent variable.

SAV_{it} is Gross domestic saving signifies the percentage of GDP, used to control for domestic resource availability for education investment in country i at time t .

$UEMP_{it}$ is Unemployment denotes the youth total as a percentage of the labour force aged 15 to 24 who are unemployed, based on ILO modeled estimates. It denotes labour market conditions that influence household income and capacity to invest in education in country i at time t .

$INFR_{it}$ is the inflation rate measure by the GDP deflator (annual %), signifying economic volatility that can erode purchasing power and the real value of education in country i at time t .

CPS_{it} is Domestic credit to private sector as percentage of GDP. It is used to measure financial access that may support education expenditure in country i at time t .

$UNEM*INFR_{it}$: Interaction effect of the unemployment and inflation on literacy. This term is added to test the combined effect on literacy in country i at time t , beyond their separate effects.

$INTR_{it}$: Lending interest rate (%). It represents the cost of borrowing, which influences the borrowing cost for education-related investments in country i in year t .

EXR_{it}: Exchange performance, measured by the annual percentage growth of exports of goods and services. It used to control for external sector performance and its effect on education affordability in country *i* at time *t*.

μ_{it} is the error term.

$\beta_{0it} - \beta_7$ = coefficients.

Variables are in annual rate and expressed in natural logarithms where applicable to reduce heteroskedasticity and interpret coefficients as elasticities. Data are sourced from the World Development Indicators, UNDP Reports, and national Central Bank Statistical Bulletins for the 15 West African countries over the period 2000 to 2023.

Prior to estimation, the integration properties are checked using panel unit root tests, the Panel Bounds Test is used to check for long-run relationship. The analysis incorporates structural break considerations following Yule (1927) and Pesaran and Shin (1999) to avoid spurious regression. The Panel Autoregressive Distributed Lag (P-ARDL) approach is employed to estimate both short-run and long-run equilibrium relationships, given the mixed order of integration. With this specification, the paper assesses how unemployment, inflation, and their complementary interaction influence human capital education across West Africa, while controlling for country-specific heterogeneity and temporal effects.

4. Regression Results

This segment ponders on the descriptive statistics and distribution characteristics in Table 1. The table recapitulates the mean, median, standard deviation, skewness, kurtosis, and Jarque-Bera statistics for each series. The panel is balanced having 358 observations for each variable across the sampled 15 West African countries. Data streams for saving, unemployment, inflation, credit to the private sector, and exchange rate were prorated due to data unavailability and consistent trend. The mean value of literacy rate over a period of 23 years is 4.313484, with a median value of 4.771341 and a standard deviation value of 2.297628. This low mean and narrow dispersion mirror a pattern of persistently low literacy levels across the region. Unemployment mean value is 7.576145 with a standard deviation value of 6.026957, while inflation mean value is 6.749960 but exhibits high volatility with a standard deviation of 11.05027. Exchange rate growth also shows substantial instability, with a mean of 7.458694 and a standard deviation value of 23.00909. Credit to the private sector and saving have mean values of 16.55698 and 11.65532 respectively, but with wide variations of 13.08869 and 17.31759, respectively. Reflecting the unstable macroeconomic environment and notable deviations from normality in region for 23 years. Unemployment, inflation, credit to the private sector, interest rate, and exchange rate are positively skewed, indicating a concentration of lower values with a long right tail 17.31759.

In contrast, literacy rate and saving are negatively skewed, with skewness coefficients of -0.41426 and -2.39033, respectively, suggesting a concentration of higher values with a left tail. Kurtosis values for inflation (28.21728), exchange rate (20.68105), and saving (10.29870) are well above 3, indicating leptokurtic distributions with heavier tails than the

normal distribution. The Jarque-Bera test statistics for all variables are non-normal except literacy rate with a probability value of 0.201940. This confirms that literacy rate only normally distributed. The observed volatility in inflation and exchange rate, and saving undermine household income and their capacity to receive education, thereby dampens literacy accumulation in West Africa. The positive skewness in unemployment suggests recurrent episodes of high youth joblessness that may alter the opportunity cost of schooling for JAPA syndrome.

Table 1: Descriptive Analysis (Summary Statistics)

	LITR	SAV	UEM	INFR	CPS	INTR	EXR
Mean	4.313484	11.65532	7.576145	6.749960	16.55698	11.93806	7.458694
Median	4.771341	15.05391	5.005000	3.883416	13.29236	6.763333	5.275290
Std. Dev.	2.297628	17.31759	6.026957	11.05027	13.08869	8.461533	23.00909
Skewness	-0.41426	-2.39033	1.801194	4.281332	1.966828	1.148344	2.938429
Kurtosis	2.229684	10.29870	6.570043	28.21728	7.442364	3.597146	20.68105
Jarque-Bera	3.199568	1135.542	383.6926	10579.35	525.1896	84.00108	5178.424
Probability	0.201940	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	60	358	358	358	358	358	358

Source: Author's computation using Eviews

4.2 Correlation Statistic Analysis

Table 2 deals with the Pearson correlation coefficients used to examine preliminary associations and the potential of multicollinearity. Literacy rate displays a moderate positive correlation with unemployment (0.473340) and credit to the private sector (0.378853). Conversely, inflation (-0.106086), and interest rate (-0.106086) unveil a very weak negative correlations and saving (-0.417913) reveal weak to moderate negative with literacy rate. Exchange rate (0.037326) has a fairly moderate positive correlation with literacy. The correlation between the independent variables is generally below 0.800000, indicating that multicollinearity is unlikely to distort the regression estimates. The positive association between unemployment and literacy rate provides preliminary evidence of an adaptive response, where higher joblessness may reallocate time to education.

Table 2: Pearson Correlation Statistic Test Result

	LITR	SAV	UEM	INFR	CPS	INTR	EXR
Coefficient	1.000000	-0.417913	0.473340	-0.122634	0.378853	-0.106086	0.037326

Source: Extract from Author's computation, E-view13 Output

4.3 Panel Unit Root Tests

Panel unit root tests are conducted to ascertain the stationarity properties of the variables and to escape spurious regression and choose a proper estimation technique. Table 3 reports

panel unit root results from the Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), and Augmented Dickey-Fuller (ADF) tests yield mixed orders of integration for 15 West African countries over 23 years. Inflation rate (INFR), interest rate (INTR), and exchange rate (EXR) are stationary at level, $I(0)$, as the null hypothesis of a unit root is rejected across all three tests at the 1% level. Compare to literacy rate (LITR), unemployment rate (UEM), saving (SAV), and credit to the private sector (CPS) that are non-stationary at level but become stationary after first differencing, $I(1)$. Given these combinations, the Panel Autoregressive Distributed Lag (P-ARDL) approach is appropriate and adopted.

Table 3: Panel Unit Root Test Result

	@ Level			@ 1 st diff			
VAR/MD	L, L & Ct	LP &Sw	ADF/Fcsq	L, L & Ct	LP &Sw	ADF/Fcsq	ORDER
LITR	-1.08192	0.14189	25.5784	-9/40006***	-10.8584***	166.334***	1
PROB	0.1396	0.5564	0.6453	0.0000	0.0000	0.0000	
SAV	0.30774	-0.64134	34.6515	-6.85187***	-11.1503***	169.738***	1
PROB	0.8209	0.2607	0.2555	0.0000	0.0000	0.0000	
UEM	-2.7011	0.6877	19.4680	-7.9476***	-6.8573***	104.268***	1
PROB	0.3935	0.7542	0.9297	0.0000	0.0000	0.0000	
CPS	-1.2779	0.8015	23.4187	-6.3705***	-8.1837***	122.574***	1
PROB	0.1006	0.7886	0.7977	0.0000	0.0000	0.0000	
INTR	22690.4***	-10130.3***	3255.68***	6324.44	-12.0272***	185.032***	0
INFR	-5.8766***	-7.7978***	118.196***	-10.4041***	-15.261***	235.507***	0
EXR	-7.2782***	-9.1664***	143.908***	-9.2020***	16.1811***	256.412***	0
PROB	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

Source: Author's computation.

Note: *** indicates level of significance at 1%, 5% and 0%, LLC, denotes Levin, Lin, and Chu, LP & SW indicates Levin and Phillips and ADF denotes Augmented Dickey-Fuller (ADF)

4.4 Short-Run and Long-Run Estimates

Table 4 presents the short-run and long-run estimates from the Panel ARDL model for the study. In the short run, none of the variables exert a statistically significant effect on literacy rate at the 5% level, except saving that is positive (0.011698) and significant ($p = 0.0332$) at 5%, implying a 0.011698 increase in literacy. Unemployment (-0.084815 with $p = 0.4807$), inflation (0.077920 with $p = 0.2294$), credit to the private sector (-0.005425 with $p = 0.6634$), interest rate (-0.024988, $p = 0.3568$), exchange rate (-0.001141, $p = 0.6735$), and the interaction term (-0.005035 $p = 0.3142$) are all statistically insignificant. The error correction term is negative and significant with (-0.268202 and $p = 0.0038$), indicating about 27% of disequilibrium is corrected annually.

In the long run, unemployment and inflation rates show substitution effect, each variable significantly reduce literacy rate. A 1 percent increase in unemployment and inflation decline literacy by about -0.253281 with $p = 0.0000$ and -0.194927 with $p = 0.0000$

respectively. Saving, interest rate, and exchange rate are statistically insignificant in the long run. Critically, Credit to the private sector and the interaction term $UEM*INFR$ (0.037879 and $p = 0.0000$) are positive and significant. This implies that a 1 percent increase in the joint effect of unemployment and inflation raises literacy by about 0.037879. Confirming the adaptive response of the West African citizens when both joblessness and price instability are high. Then their opportunity cost for schooling falls, and they reallocate time for education as a long-run hedge. Thus, unemployment and inflation are harmful individually, their complementary effect is beneficial for education in West Africa.

Table 4.: Short-Run and Long-Run Panel ARDL Estimates: Complementary Impact of Unemployment and Inflation on literacy rate in West Africa from 2000 to 2023.

Variable	Coefficient	Short Run		Coefficient	Long Run	
		Std. Error	Prob.		Std. Error	Prob.
SAV	0.011698	0.005458	0.0332	-0.012357	0.013467	0.3599
UEM	-0.084815	0.120062	0.4807	-0.253281	0.041243	0.0000
INFR	0.077920	0.064652	0.2294	-0.194927	0.043782	0.0000
CPS	-0.005425	0.012446	0.6634	0.114106	0.012312	0.0000
INTR	-0.024988	0.027059	0.3568	0.002842	0.061721	0.9633
EXR	-0.001141	0.002705	0.6735	0.004891	0.005486	0.3736
UEMP*INFR	-0.005035	0.004991	0.3142	0.037879	0.007620	0.0000
C	0.916718	0.331876	0.0062			
CointEq	-0.268202	0.091566	0.0038			
Log-Likelihood		-49.24010				

Source: Author's computation using EViews

4.5 Long-Run Bounds Test Estimates

Table 5 accounts the country-specific bounds test results indicating long-run relationship for Cape Verde and Ghana. For these two countries, their F-statistics exceed the lower and upper critical values of 3.210 and 4.163 at the 5% level. Evidencing a strong long-run relationship between the macroeconomic variables and literacy across West Africa and the use of the long-run Panel ARDL estimates.

Table 5 .Bounds Test (Long Bounds Test) Results

Cross-Section		Obs.	LITR
			F-Stat.
1		23	***4.307988
2		23	***7.562212
Literacy rate			3.21 - 4.163

Note *** indicates computed F-Stat > critical value at 5% level of significance
This division gives insight into the results analysed above. The descriptive results indicate low volatility in literacy rate (LITR) across the region, with a mean of 4.313484 and a negative

skewness of -0.41426. This reflects persistently low literacy levels and asymmetry in distribution. The kurtosis values for inflation, exchange rate, and saving exceed three, specifying leptokurtic distributions with heavy tails. The Jarque-Bera test rejects the null hypothesis of normality at the 5% level for all variables except literacy. Empirically, none of the variables exercise a statistically significant effect on literacy rate at the 5% level in the short run, except saving that shows a positive increase of 0.011698 at 0.0332 significant level. Unemployment -0.084815, $p = 0.4807$, inflation 0.077920, $p = 0.2294$, credit to the private sector -0.005425, $p = 0.6634$, interest rate -0.024988, $p = 0.3568$, exchange rate -0.001141, $p = 0.6735$, and the interaction term UEM*INFR -0.005035, $p = 0.3142$ are all statistically insignificant. The interaction term implies a -0.005035 decrease in literacy in the short run, suggesting that unemployment and inflation act as substitutes when macroeconomic instability is high. The error correction term is negative and significant (CointEq = -0.268202, $p = 0.0038$), indicating that about 27% of disequilibrium is corrected annually.

Whereas in the long run, a 1 percent rise in the unemployment rate lowers literacy by about -0.253281 with $p = 0.0000$. Also a 1 percent growth in inflation rate diminishes literacy by about -0.194927 at a probability of 0.0000. Credit to the private sector has a positive increase of about 0.114106 and statistically significant on literacy at $p = 0.0000$. Saving, interest rate, and exchange rate are statistically insignificant in the long run. Critically, the interaction between unemployment and inflation rates yields a positive and statistically significant effect on literacy. A 1 percent increase in interaction term (UEM*INFR) leads to about a 0.037879 increase in literacy at $p = 0.0000$. This infers that when stag inflation occur, the opportunity cost for schooling disappears and households convert time for education to travel out as a long-run hedge. This aligns with the adaptive response mechanism under Endogenous Growth Theory (Romer, 1986; Lucas, 1988). In contrast, the individual negative effects of unemployment and inflation connote Human Capital Theory (Becker, 1962; Schultz, 1961), which theorises that macroeconomic volatility lessens investment in education. The Panel Bounds results specify a strong cointegration for 2 West African countries (Cape Verde and Ghana), representing a long-run relationship between unemployment, inflation, and literacy over the 23-year period. This finding is consistent with UNECA (2023) and ECOWAS Vision 2050, which documented persistent low literacy and disparities in education outcomes across West Africa.

The Granger causality results imply that the interaction term cannot be used to forecast literacy in the short run but not the reverse. The Diagnostic (Autocorrelation) results present the LM test with Rao F-statistic values of 3.495047, 5.132491, and 0.564450 at lags 1, 2, and 3, with probability values of 0.0078, 0.0004, and 0.6885 respectively. This signifies that autocorrelation happens at shorter lags later disappears at lag 3. The Impulse Response Function (IRF) analysis shows that a shock to the interaction interactive term leads to a persistent expansion in literacy in West Africa over the forecast horizon. Overall, the findings suggest that unemployment and inflation individually constrain literacy in West Africa, but their complementary term is positive in the long run. This aligns with the view that education serves as a coping strategy during periods of labour and price instability, though the magnitude remains minimal at 0.037879.

4.6 Causality Test Results

Table 6 shows the pairwise Granger causality results, indicating literacy rate does not Granger-cause the interaction term ($Zbar\text{-Stat} = 3.856$, $p = 0.0001$) and $UEM*INFR$ does not Granger-cause literacy ($p = 0.1204$) in West Africa. This implies unidirectional causality running from literacy rate to the interaction term in the short run but the behaviour of literacy in the past is capable of predict the interaction behaviour.

Table 6. Causality Test Results

Null Hypothesis:	Zbar-Stat.	Prob.
$UEM*INFR$ does not homogeneously cause LITR	1.55320	0.1204
LITR does not homogeneously cause $UEM*INFR$	3.85609	0.0001
$UEMINFR$ does not homogeneously cause UEM	-1.21331	0.225
UEM does not homogeneously cause $UEM*INFR$	4.43293	9.00E-06

4.7 Diagnostic Test (Autocorrelation)

Table 7 presents the LM test for serial correlation in the residuals of the literacy model, indicating the significant of autocorrelation at lags 1 and 2, with p-values of 0.0078 and 0.0004, respectively that later disappeared at lag 3 ($p = 0.6885$). The Rao F-statistic values affirm that the residuals are free from autocorrelation at higher lags, indicating that the model is correctly specified.

Table 7. Diagnostic Test (Autocorrelation)

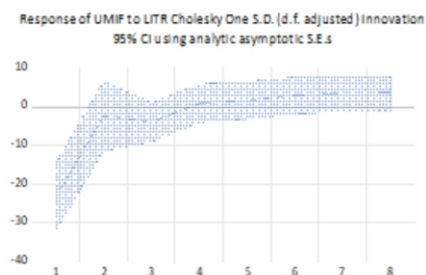
Model	Lag	Rao F-stat	Prob.	Lag	Rao F-stat	Prob.	Lag	Rao F-stat	Prob.
	1	3.495047	0.0078	2	5.132491	0.0004	3	0.564450	0.6885

Source: Extract from Author's computation

4.8 Impulse Response Function

Figure 1 spectacles that a positive shock to $UEM*INFR$ produces a positive and persistent effect on literacy rate in West Africa. Following the shock, the response is initially high and positive between periods 1 and 2, declines in period 3, and rebounds between periods 4 and 8. The response remains above zero throughout the forecast horizon. This pattern proposes that increases in the joint effect of unemployment and inflation generate sustained improvements in education outcomes over the long run, consistent with the adaptive response mechanism.

Figure 1: Impulse Response Function of Literacy Rate to $UEM*INFR$ Shock



Source: Author's computation

5. Conclusion and Recommendation

The study was inspired by the weak literacy outlook and the high incidence of youth unemployment that have induced low employability and outward migration in the region (ECOWAS Vision 2050). The findings establish that unemployment and inflation are key constraints to literacy accumulation in West Africa in the long run especially for the period under review. High unemployment shrinks expected returns on education, whereas inflation erodes household income and capacity to invest in schooling. This supports the Human Capital Theory (Becker, 1962; Schultz, 1961), which contends that macroeconomic stability is necessary for human capital investment sustainability. Also the interaction term has a minimal positive and significant effect on literacy in the long run. This aligns with Endogenous Growth Theory (Romer, 1986; Lucas, 1988), which underscores time allocation between work and education. The result advocates an adaptive coping mechanism whereby households pursue education when both joblessness and price instability are high. Based on these findings, the study concludes that while unemployment and inflation individually depress literacy, their joint effect induces adaptive human capital investment. Credit to the private sector also emerges as a significant enabler of literacy. Policy interventions aimed at employment stabilization, inflation control, education quality reform, and financial access are therefore critical to translating this adaptive response into sustained literacy gains across West Africa.

The findings recognize the complementary impact of unemployment and inflation as a significant factor influencing literacy in West Africa. A stable macroeconomic environment is critical because a literate population is a productive population that translate into greater wealth of a nation. Having stable employment and low inflation eases the cost of education and rises household capacity to invest in education. To that end, West African governments should pursue macroeconomic stability by maintaining single-digit inflation, promote youth employment generation, quality education and skills development to align school curricula with labour market needs. This will reduce the incidence of out-of-school youth and heavy brain drain, and ensure that the adaptive response to unemployment and inflation translates into employable skills across West Africa. By implementing policies that stabilize employment, control inflation, and improve education quality, West African countries can mitigate the negative impact of macroeconomic instability and promote sustainable improvements in literacy, in line with ECOWAS Vision 2050 and the SDGs 2060 goals.

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