Original Research Article

The Impact of Exchange Rate Volatility on Sectoral Output in Liberia

ABSTRACT

This study investigates the effects of exchange rate volatility on sectoral output in Liberia, focusing on agriculture, mining, and manufacturing. Using monthly time series data ranging from 2010 to 2022 and estimating the exchange rate volatility using the ARCH model, the study found a strong sector-specific impact along with an overall economic impact on output with a significant coefficient of (-2.868) at 10%, 5% and 1% level of significance .We found that the agriculture with a coefficient of (-0.2127) and manufacturing sectors (-0.5171) proxy by value added as a percentage of GDP are negatively affected by exchange rate fluctuations due to their heavy reliance on imported raw material, which increases production costs and reduces output. Conversely, the mining sector, particularly gold production as measured by key output volume, shows a positive relationship with exchange rate volatility with a coefficient of (3.9677) significant at 10% level of significance, as global demand for gold rises in response to currency instability. The findings underline that policy interventions are needed to stabilize the exchange rate, particularly for agriculture and manufacturing. In fact, given the dual currency system of the country and the high level of dollarization, the country needs targeted policies to enhance sectoral resilience in its way to attain economic growth.

Keywords: Volatility modeling; exchange rate; gdp growth; agriculture; mining; manufacturing, dollarization

1. Introduction

Liberia is one of the most dollarized nations in the world and this has come with its share of challenges. Between 2007 and 2020, the IMF estimated the deposit dollarization to be around 84%, financial dollarization at 70%, and credit dollarization at 91% (IMF Staff Country Reports 2022). Dollarization is a situation where a country decides to use two currencies as legal tender; its domestic currency and a generally stronger and more established currency- the USD.

Liberia operates on a dual currency with prices of goods and services quoted in US dollars or its Liberian Dollar (LRD) equivalent, the domestic currency - this goes as a far back as the country's establishment as a republic in 1847.While the heavy dollarization plays an important role in exchange rate fluctuation by limiting the Central Bank Liberia's (CBL) ability to roll out its monetary policy tools effectively, there are other factors that can be attributed to the high exchange rate fluctuation in Liberia. Sam Sumo (2017) finds that the relative consumers' price of Liberia’s CPI to the United States’ CPI was a significant determinant of the Liberian dollar to the US dollar nominal exchange rate in the long run and changes in how much Liberia and the US import and export goods (trade balances) can, in the short term, affect the value of their currencies (exchange rate). Exchange rate fluctuation can have a significant implication on level of productivity in Liberia. This can lead to higher production costs for businesses that rely on imported materials or equipment. Additionally, Liberian consumers may have less purchasing power for imported goods, potentially reducing demand and output in some sectors. A weakened LRD can make exports more competitive in the international market, potentially boosting export volumes and increasing output in export-oriented industries.

During the 2023 General and Presidential elections the current President, Joseph Nyuma Boakai , then opposition leader , made great emphasis on the potential of the agriculture sector in fostering economic growth. As such it became the first pillar of his Agenda - ARREST (Agriculture, Roads, Rule of Law, Education, Sanitation, and Tourism). The success of the President agenda will rely heavily on agriculture output since it is the most tangible of the six pillars. However , the agriculture sector faces a unique challenge when it comes to the impact of exchange rate fluctuations.For example, many agricultural inputs used in Liberia, like organic and inorganic fertilizers, machineries, and pesticides, are often bought on the international market using the US dollars. When a country's currency weakens against the currency where these inputs are purchased ie the USD, it becomes more expensive to import them. This can squeeze profit margins for farmers or force them to seek alternative, potentially lower-quality, raw material.

Fluctuations can affect the price farmers receive for their crops. A strong domestic currency can make exports more expensive for foreign buyers, reducing demand and potentially lowering export earnings. This constant rise and fall in value creates an unpredictable business environment, which is undesirable for a healthy economy. Of course, a central bank should, in theory, smooth things out, but Liberia’s high level of dollarization meant that traditional monetary policy tools such as interest rates are mostly less effective.

The continuous depreciation of the Liberian dollar against the USD underlines the critical role that exchange rate plays in the economy. The impact of exchange rate on different sectors of the economy has to be researched in order for the policymakers to understand how best to protect the economy against its effects of volatility.

The Liberian economy faces a great challenge by the presence of a high level of dollarization which affects the effectiveness of monetary policy tools. This causes high fluctuation in the exchange rate. However, there exist a substantial gap in understanding the specific impacts of exchange rate fluctuations on key output sectors In Liberia and this can affect the success of the ongoing ARREST Agenda. This paper will be the first to provide empirical evidence on how the fluctuation in the exchange rate affects the productivity levels of sectors that are vital to the growth of the Liberian economy.

The paper is separated in 5 sections. The next section will explore the existing literature in this area. The methodology , model specification and data source are in section 3 , while section 4 provides the analysis and findings and the study concludes in the last section.

2. Related Literature

There is a rich body of literature that provides evidence to support the Mundell-Fleming Model with most focusing on the relationship between exchange rate and economic growth and Output level in the economy as a whole.

Sani ,Hassan Azam (2016) examines the empirical relation between exchange rate volatility and the level of output in five English-speaking countries of the Economic Community of West African States, namely Nigeria, Ghana, Gambia, Sierra Leone, and Liberia. The research covers a period extending from 1991 to 2014; co-integration tests and error correction modeling estimation techniques are used.The analysis reveals significant effects of exchange rate volatility on output levels across the selected countries, with all except Liberia experiencing negative impacts.

In 2014, Olufayo and Fagite (2014) examined the impact of exchange rate volatility on both oil and non-oil sectors' export performance in Nigeria. Their study utilized the GARCH econometrics method to measure exchange rate volatility and the seemingly unrelated regression (SUR) method to estimate coefficients for two system equations. The findings from ARCH and GARCH analyses indicated significant exchange rate volatility. However, the SUR model indicated that the exchange rate negatively affected both sectors, though this effect was not statistically significant

Doganlar (2002) investigates the influence of exchange rate fluctuations on the export performance of five Asian nations, namely Turkey, South Korea, Malaysia, Indonesia, and Pakistan. Employing an Engle-Granger residual-based co-integrating method, the study assesses the impact of volatility on exports. Findings suggest that heightened exchange rate volatility led to decreased real exports in these countries. This observation suggests that producers within these nations may exhibit risk aversion tendencies. Consequently, producers may then turn to home markets instead of foreign markets if the rate of volatility in the exchange rate rises.

Perrazzi and Romero (2022) test the impact of exchange rate volatility on economic growth in a sample of data that includes 194 countries for the period from 1995–2019. Specifically, the exchange rate volatility acts as the main explanatory variable, estimated using GARCH models, whereas dynamic panel data models are estimated in the study. Additionally, control variables such as economic openness, financial development, investment, government spending, and expected educational attainment are included. Countries were categorized based on government corruption levels. Estimates were derived using both Difference and System Generalized Method of Moments. The findings consistently reveal a significantly negative impact of exchange rate volatility on economic growth, a effect that diminishes as financial systems develop. Notably, countries with higher levels of corruption exhibit a lower impact of volatility, possibly due to their accustomedness to economic instability associated with governance deficiencies, which they incorporate as part of their operational costs.

The literature reflects the view that the stability of the exchange rate is one of the leading factors of economic growth and export performance. It is revealed that policymakers should make allowance for the implications of the volatility of the exchange rate and ensure that measures countering such negative impact are implemented in highly sensitive areas and sectors of currency fluctuations. In essence, the findings indicate that the relationship among exchange rate volatility, economic growth, and governance factors is complex, and hence broad policy frameworks are still essential for stability and resilience in the macroeconomy.

3. Methodology

3.1 Data Source

The study utilizes monthly time series data sourced from the Central Bank of Liberia's annual reports from April 2010 to December 2022. The key variables include the monthly exchange rate of LRD/USD and monthly inflation computed from the monthly consumer price index in Liberia. For sectoral performance, the key output value of different products from the 3 sectors is used. Annual data on GDP growth, interest rate, imports, and inflation used in the study is from World Bank database from 1974 to 2022. Stata 15.0 is used in the data analysis.

3.2 Model Specification

Borrowing from the IS-LM model, Mundell (1963) and Fleming (1962) , the following model specification is used in the empirical study;

$$GDP_{growth_t} = \beta_0 + \beta_1 * GDP_{growth_{t-1}} + \beta_2 * EVOL_t + \beta_3 * INF_t + \beta_4 * INTR_t + \beta_5 * EXP_t + \varepsilon_t$$

GDP_{growth_t} is the growth in GDP , $EVOL_t$ is the exchange rate volatility from the ARCH model, INF_t is inflation, $INTR_t$ is lending rate , and EXP_t is export value.

The second model uses monthly data from the agriculture, manufacturing, and mining sectors.

$$Output_t = \beta_0 + \beta_1 * Output_{t-1} + \beta_2 * EVOL_t + \beta_3 * INF_t + \beta_4 * INTR_t + \varepsilon_t$$

Where $Output_t$ represents the key output volume for the mining sector, Value Added (% of GDP) of Agriculture and Value Added (% of GDP) of Manufacturing for each corresponding sector

3.3 Estimation Technique

Volatility, as measured by standard deviation or variance, is often used as a crude measure of the fluctuation in financial data.Take the model below

$$y = \beta_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon$$

The linear paradigm as described above is a useful one. Here, the error $\boldsymbol{\varepsilon t}$ is assumed to have a zero mean and a constant variance. However, linear structural (and time series) models such as these are unable to explain important features common to financial data, including volatility clustering or volatility pooling where volatility in financial data appears in bunches with large changes (of either sign) are expected to follow large changes, and small changes (of either sign) follow small changes or Leverage effects – the tendency for volatility to rise more following a price fall than following a price rise of the same magnitude. A non-linear alternative to the standard deviation is the Exponentially Weighted Moving Average (EWMA) model, S.W. Roberts (1959),this is a time series model that Allows more recent observations to have a stronger impact on the forecast of volatility than older data points. The latest observation carries the largest weight –while weights associated with previous observations decline exponentially over time since volatility is likely to be affected more by recent events, which carry more weight, than events further in the past.

One particular non-linear model in widespread usage in finance and used in this study is the ARCH' model, Engle (1982). ARCH stands for 'Autoregressive Conditionally Heteroscedastic'.The assumption of the Classical Linear Regression Model (CLRM) that the variance of the errors is constant (homoscedasticity) is implausible, however, if the errors are heteroscedastic, but assumed homoscedastic, the coefficients are still unbiased, but the standard errors and confidence intervals estimated will be too narrow, giving a false sense of precision, hence it makes sense to consider a model that describes how the variance of the errors evolves.

Even a cursory look at financial data suggests that some periods are more volatile than others; as such, the expected value of the magnitude of error terms at sometimes is greater than at others and this is the capture by the EWMA. Moreover, these volatile times are not scattered randomly across, there is a degree of autocorrelation in the uncertainties. This is known as "volatility clustering" -- the tendency of large changes in financial data to follow large changes and small changes to follow small changes. The ARCH is designed to deal with just this set of issues.

Under ARCH, the conditional mean equation describes how the dependent variable, yt, varies over time. This could take almost any form that the researcher wishes.

$$y_t = \beta_1 + \beta_2 \cdot x_2 + \beta_3 \cdot x_3 + \beta_4 \cdot x_4 + \varepsilon_t$$

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

The conditional variance equation is written as:

$$\delta_t^2 = var\ (\varepsilon_t\ |\varepsilon_{t-1},\ \varepsilon_{t-2}|)$$

Under the ARCH model, the 'autocorrelation in volatility' is modeled by allowing σ_t^2 to depend on the immediately previous value of the squared error (innovations; newest piece of information from the previous period):

$$\delta_t^2 = \alpha_0\ + \alpha_1 \varepsilon_{t-1}^2$$

The above model is known as an ARCH (1), since the conditional variance depends on only one lagged squared error. Note that while ARCH is called autoregressive (AR), it is only a moving average (MA) in the SQUARED noise sequence.

The value of the conditional variance must always be strictly positive; The variables on the RHS of the conditional variance equation are all squares of lagged errors, and by definition will not be negative. In order to ensure positive conditional variance estimates, all of the coefficients in the conditional variance are required to be NON-NEGATIVE.

The model given by Eqn 1 and 2 above could easily be extended to the general case where the error variance depends on q lags of squared errors [ARCH(q)]. The model given could easily be extended to the general case where the error variance depends on q lags of squared errors [ARCH(q)]

$$\delta_t^2 = \alpha_0 + \alpha_1 \cdot \varepsilon_{t-1}^2 + \alpha_2 \cdot \varepsilon_{t-2}^2 + \cdots + \alpha_q \cdot \varepsilon_{t-q}^2$$

ARCH provided a framework for the analysis and development of time series models of volatility. The study uses the ARCH model instead of the GARCH model because after the modeling volatility of the exchange rate , we conducted the LM test; the LM test is a test for no conditional heteroskedasticity against an ARCH model and there was no significant autocorrelation effect in our model.

After estimating the volatility using the fitted ARCH model , we use a time series technique to run a regression model with the estimated volatility as independent variables. We also controlled for inflation, interest rate and export.

4. Results and Discussion

Table 1 Descriptive Statistics

Macroeconomics Indicators

Variable	Mean	Min	Max	Std. Dev.
GDP Growth	1.3	-51.0	106.3	21.2
Exchange Rate	66.7	23.7	191.5	38.4
Inflation	6.0	-10.0	53.8	9.8
Interest Rate	10.6	-21.6	30.4	9.9
manufacturing sector value added (% of GDP)	3.0	1.9	4.1	0.9
Agriculture sector value added (% of GDP)	50.6	34.4	79.0	15.6

Mining Sector

	Unit	Mean	Median	Max	Min	Std
Gold	Ounces	8,124.33	2,045.00	46,262.59	131.23	9,183.70
Diamond	Carats	4,908.12	4,517.17	15,193.00	204.00	2,612.36
Iron Ore	Metric Tons	351,733.50	360,005.20	1,545,127.00	22,800.00	194,514.90

From Table 1, the mean of the exchange rate in Liberia throughout study is LRD 66.73 but the standard deviation is LRD 38.37 which gives an overview of the fluctuation in the LRD. Inflation also shows that could be as high as 53.8% but also prices could by 10%.The average GDP growth over the period indicates a 1.3% average growth, but this is highly affected by the range of growth between -51.3% to 106.8%. The high level of variability was expected due to the political instability the country experienced **-** this caused economic growth to plunge downward in huge magnitude.

Table 2. Stationary Test Result for Unit root

Variable	Level	ADF Statistics	1% Critical	5% Critical	10% Critical	pvalue	Inference
Agriculture	Level	-1.465	-3.75	-3.00	-2.63	0.5509	I(1)
	First difference	-3.788	-3.75	-3.00	-2.63	0.0030	
manufacturing	Level	-1.254	-3.75	-3.00	-2.63	0.6497	I(2)
	Second difference	-2.892	-3.75	-3.00	-2.63	0.0462	
Gold	Level	-1.752	-3.75	-3.00	-2.63	0.4044	I(1)
	First difference	-3.194	-3.75	-3.00	-2.63	0.0203	
Diamond	Level	-2.391	-3.75	-3.00	-2.63	0.1443	I(1)
	First difference	-3.214	-3.75	-3.00	-2.63	0.0192	
Iron Ore	Level	-2.471	-3.75	-3.00	-2.63	0.1227	I(2)
	Second difference	-3.136	-3.75	-3.00	-2.63	0.0240	
GDP growth	Level	-4.492	-3.563	-2.92	-2.595	0.0002	I(0)
inflation	Level	-7.498	-3.563	-2.92	-2.595	0.0000	I(0)
Export	Level	-3.925	-3.641	-2.955	-2.611	0.0019	I(1)
	First difference	-10.212	-3.648	-2.958	-2.612	0.0000	
Interest rate	Level	-5.061	-3.702	-2.98	-2.622	0.0000	I(0)

Table 3 Exchange Rate Volatility Estimation

	Mean equation	
Variable	**Coeffcient**	**P- Values**
Constant	0.0066716	0.000*
D_ExchangeRate (-1)	0.5148921	0.009**
D_ExchangeRate(Moving Average)	-0.6826423	0.000*

	Variance equation	
Variable	**Coeffcient**	**P- Values**
Constant	0.0003074	0.000*
ARCH (1)	2.144454	0.000*

The results from the conditional mean equation, ARIMA(1,0,1) show a positive relationship between the change in at time t and at time t-1. This means today's change in exchange rate depends positively on yesterday's change in exchange rate. Simply put, holding other factors constant if there was an increase in yesterday's exchange rate, there is strong evidence that the exchange rate today will also go up with a significant p-value. The Augmented Dicker-Fuller Test on the change in exchange rate shows that the variable was stationary in its transformed form (from raw exchange rate to difference in exchange rate from the previous period). Since the transformed form is what we used to model the volatility, that means the d term in the ARIMA (p,d,q) is zero; which means there was no need for differencing to make a variable stationary.

The conditional variance equation shown in the table above is an ARCH model of one lag, allowing $\boldsymbol{\sigma t2}$ to depend on the immediately previous value of the squared error (innovations; newest piece of information from the previous period). The model shows that the coefficient on the lagged squared residual is positive and significant

Table 4. Results from Archlm test

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. estat archlm, lag(1/15)
LM test for autoregressive conditional heteroskedasticity (ARCH)
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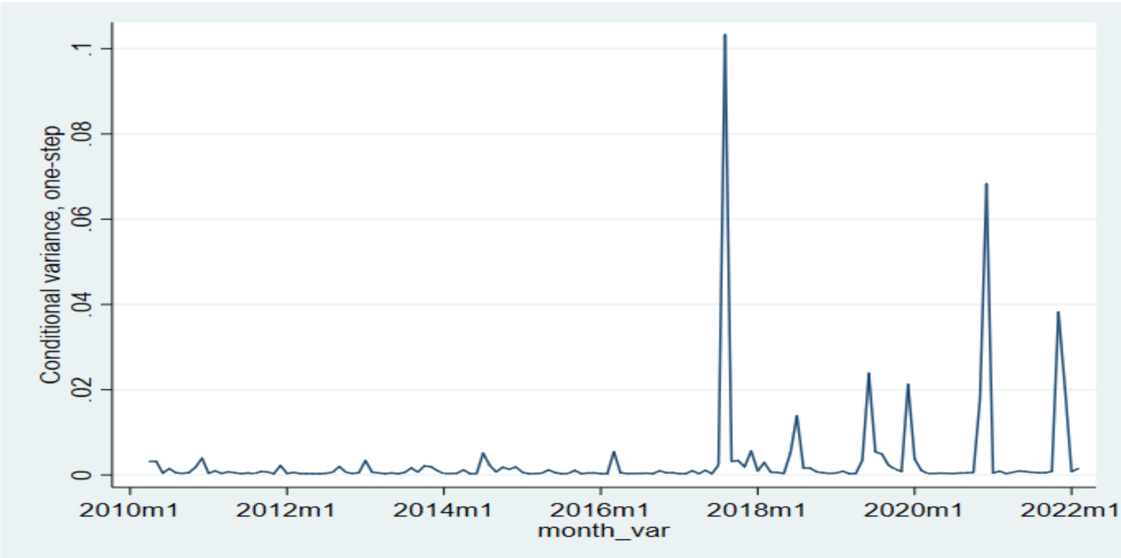
lags(p)	chi2	df	Prob > chi2
1	0.295	1	0.5870
2	0.701	2	0.7044
3	0.856	3	0.8360
4	3.813	4	0.4319
5	7.061	5	0.2161
6	7.912	6	0.2446
7	11.133	7	0.1329
8	10.195	8	0.2516
9	8.349	9	0.4994
10	8.730	10	0.5579
11	9.957	11	0.5343
12	12.165	12	0.4325
13	13.215	13	0.4314
14	14.000	14	0.4497
15	13.000	15	0.6023

H0: no ARCH effects *vs.* H1: ARCH(p) disturbance

The Arch LM test used to detect the presence of autoregressive conditional heteroscedasticity (ARCH) was performed on the residual from the model and shows there was no significant ARCH effect which indicates that our ARCH model has done a good job in capturing the volatility clustering and there was no need to proceed to a GARCH model. The chart below shows the estimated sample volatility as predicted by the ARCH (1) model.

Fig 1. volatility clustering



4.2 Effect on the GDP growth of exchange rate volatility

The primary objective of this paper is to test whether volatility in exchange rate actually has an effect on the economy - the economy is proxied by GDP growth borrowing from Alagidede and Ibrahim (2016). Using the model specification in eq 1, we ran the following time series error correction model, and the result is shown in the table below.

Table 5 GDP Growth Model

	D_gdpgrowth			
	Coef.	Std. Error	t- statistics	Pvalue
GDPGrowth t-1	-0.451	0.075	-6.000	0.000
EVOL	-2.868	0.708	-4.050	0.000
INFL	-1.184	0.786	-1.510	0.132
INTR	-0.734	0.980	-0.750	0.454
EXP	0.081	0.047	1.720	0.085
Constant	-4.245	1.490	-2.850	0.004

The result from the model shows a negative relationship between Economic growth as measured by GDP growth and exchange rate volatility with a coefficient of -2.868 (-4.050) which is significant at a 99% confidence level. This means that when exchange rates are very volatile, it leads to negative economic activities that reduce economic growth. This finding corresponds to the theoretical postulation made by Obstfeld and Rogoff (1998) that large swings in exchange rates can hurt the domestic economy.

For an economy of Liberia's size and the domination of a dual currency maintaining a stable exchange rate is essential growth of the country’s economy

Inflation, used as a control variable was found to have a negative effect on economic growth but only significant at the 85% confidence level. As you would expect interest rate has a negative and insignificant effect on economic growth this is because raising interest rates causes the cost of borrowing to increase and reduces economic growth.

4.3 Effect of Exchange Rate Volatility on Sectoral Output

4.3.1 Agriculture sector

Table 6. Agriculture Output Model

	d.agriculture			
	Coef.	*Std. Error*	*t- statistics*	*Pvalue*
agriculture (t-1)	0.0592	0.2245	0.2600	0.7920
EVOL	-0.2127	0.8286	-0.2600	0.7970
INFL	-0.2835	0.1296	-2.1900	0.0290
INTR	2.5015	1.0454	2.3900	0.0170
Constant	-0.2313	1.0955	-0.2100	0.8330

The agriculture sector output as proxied by Agriculture value added (% of GDP) is one of the major contributions to the Liberian economy. The result from our error correction model shows a negative relationship between the output in the agriculture sector and the fluctuation in the exchange rate. When exchange rates are very unstable, the amount of production from agriculture reduces as shown by the estimated coefficient (-0.2127) this is because products used in the production of domestic products are sold to farmers in UD dollar quotation due to the high level of dollarization and prices in the Liberian market set by international importers are mostly quoted in USD.

4.3.2 Mining Sector

Unlike the Agriculture sector which was measured by value added to GDP, the analysis of the mining sector uses the key output volume of the 3 main products extracted from the mining industry in Liberia as per the Central Bank of Liberia due to the unavailability of any measure that contains value added. The key output volume measures the amount of gold (ounces), diamond (carats), and iron ore (metric tonnes). The data are then transformed to their log difference. The results from the model are shown in the table below.

Table 7 . Mining Sector Model

Gold	Coef.	Std. Error	t- statistics	Pvalue
Gold (t-1)	-0.2045	0.2990	-0.6800	0.4940
EVOL	3.9677	1.4820	2.6800	0.0070
INFL	-0.2835	0.1296	-2.1900	0.0290
INTR	-0.8446	0.2582	-3.2700	0.0010
Constant	0.5676	0.5079	1.1200	0.2640

Diamond	Coef.	Std. Error	t- statistics	Pvalue
Diamond (t-1)	-0.3321	0.8332	-0.4000	0.6900
EVOL	0.3442	0.2564	1.3400	0.1790
INFL	0.0075	0.0381	0.2000	0.8430
INTR	1.4603	1.8059	0.8100	0.4190
Constant	-0.3566	0.4279	-0.8300	0.4050

Iron Ore	Coef.	Std. Error	t- statistics	Pvalue
IronOre (t-1)	-0.7350	0.9628	-0.7600	0.4450
EVOL	0.1962	0.4809	0.4100	0.6830
INFL	0.0274	0.1061	0.2600	0.7960
INTR	-3.9661	4.8460	-0.8200	0.4130
Constant	-0.7338	1.1650	-0.6300	0.5290

The results show that there is a positive relationship between the raw output from the mining sectors and the fluctuation in the exchange rate but generally not significant except for Gold. The coefficient (3.9677) of Exchange rate volatility on Gold key output volume being positive is indicative of the setting in which gold is mined in Liberia and the overall behavior of Gold as a product. The gold mines in Liberia are extracted by foreign companies, mined by foreign workers, and sold on the international market which means fluctuation in the domestic currency is unlikely to negatively affect the mining of gold. Another plausible reason that could explain the positive coefficient is the fact that the demand of gold tends to increase when exchange rates are volatile because gold is generally used to protect wealth against fluctuations like exchange rate and inflation and this is also observed globally as found by Tanin, T. I., Sarker, A., & Brooks, R. (2021). Mashayekhi, B., Sadr Ara, M., & Jafari, A. (2013) also found a positive relationship when they analyzed gold price and exchange rate volatility. The magnitude of the impact exchange rate volatility had on the output volume of gold we found was quite larger compared to diamond and iron ore but all positive.

4.3.3 Manufacturing Sector

Table 8. Manufacturing model

	manufacturing			
	Coef.	*Std. Error*	*t- statistics*	*Pvalue*
manufacturing (t-1)	0.5997	0.3120	1.9200	0.0550
EVOL	-0.5171	0.4343	-1.1900	0.2340
INFL	-0.0318	0.0130	-2.4400	0.0150
INTR	-0.2664	0.2856	-0.9300	0.3510
Constant	-0.0985	0.1659	-0.5900	0.5530

Manufacturing, value added (% of GDP) is used as an indicator to measure the output of the manufacturing sector. The coefficient (-0.5171) from the error correction model above shows that fluctuation in the exchange rate can have a negative impact on the manufacturing sector in liberia. Since manufacturers always depend on imported raw materials and components, fluctuating exchange rates result in unpredictable costs. There are also possibilities of certain challenges in setting stable prices by the manufacturers because of the volatility in the exchange rate, hence complicating proper planning of a budget as well as management of cash flow. This is very risky for investment in any production capacity or innovation since the company may wait for a better tomorrow to make proper decisions on its future costs. The findings also show inflation (-0.00318)and interest rate (-0.2668) have negative impact on manufacturing. Inflationand high interest rates negatively impact manufacturing primarily through increased costs and reduced consumer demand.

5. Conclusion

Empirical findings from the study proved that the volatility of the exchange rate significantly impacted sectoral performance in Liberia, affecting agriculture, mining, and manufacturing differently. The results confirm that sectors that heavily on imports for production, such as agriculture and manufacturing, experience a negative impact from fluctuations in the exchange rate. Specifically, agriculture is affected due to the costlier inputs traded in USD from when revenue are generated in LRD, while manufacturing suffers from unstable raw material costs. On the other hand, the mining sector measured by key output volume, particularly gold production, shows resilience and may even benefit from exchange rate fluctuations, plausibly due to global demand for gold as a hedge against currency instability.

The results highlight the importance of stabilizing the exchange rate to ensure sustained sectoral growth and economic stability in Liberia. For policymakers, addressing the negative impacts of exchange rate volatility, particularly in agriculture and manufacturing, is crucial for fostering a favorable business environment and economic growth since the two sectors contribute to almost half of the country's GDP and an estimated 70% of the population relies on agriculture. The positive effect on gold mining suggests that sectors exposed to global markets may require different strategies compared to domestically focused industries. As the country continues to navigate its dual currency system and high dollarization, a sound approach that supports sectoral resilience against exchange rate shocks is essential for long-term economic growth.

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