Examining the Impact of Exchange Rate Volatility on Agricultural Exports in Zimbabwe 1980-2022

Collin Chikwira[1]

Abstract: The study examines the impact of exchange rate volatility on Zimbabwe's agricultural exports (1980–2022), highlighting their economic significance. Using ARDL analysis, it finds short-term positive but long-term negative effects of exchange rate fluctuations, with inflation significantly reducing exports over time. GDP, FDI, and production have temporary effects. Policy recommendations include hedging tools and budgetary stabilisation to mitigate risks, enhance export competitiveness, and drive sustainable development. The study contributes to understanding trade-exchange rate dynamics in developing nations, offering actionable insights for policymakers to foster export-led growth and ensure resilience in Zimbabwe's agricultural sector.

Keywords: exchange rate volatility, Agricultural Exports, inflation, Zimbabwe

1. Introduction

Zimbabwe, often called the "breadbasket of Africa" in its pre-independence era, has long been recognised for its significant agricultural exports, including tobacco, beef, cotton, and sugar. These exports contribute substantially to national income and support employment, foreign exchange earnings, and economic growth. However, the country's agricultural sector has faced considerable challenges over the past four decades, including land reforms, climate change, inadequate access to inputs, and exchange rate volatility. Despite periodic government interventions such as Command Agriculture and irrigation schemes, Zimbabwe's agricultural exports remain vulnerable to these macroeconomic disruptions.

Export returns are instrumental in most economies, including Zimbabwe's. Indeed, it is impossible to overemphasise the role of exports in the growth and development of any economy. The exports, particularly agricultural, considerably impact Zimbabwe's national revenue. This means net exports increase the national income (Mufana, 2016). More sales of agricultural produce also help reduce unemployment difficulties, improve the balance of payment, improve foreign exchange earnings, and

[1] Faculty of Accounting Sciences, Department of Auditing, University of South Africa, Pretoria, South Africa, Corresponding author: collincolchi@gmail.com.

reduce reliance on expensive borrowing outside the country (Were, 2002). This means that in support of the importance of exports (Edwards, 1998; Chimhore & Chivasa, 2021), the export-led growth rule is a well-rooted policy whereby the foreign exchange from export growth enables the import of capital goods that may help in raising the production capacity of an economy.

Nonetheless, the export development of Zimbabwe has been pointing to specific changes in the recent decade, though it is under the list of leading exporters of agriculture products Profile (2011). The agricultural industry has faced many challenges. Crop and livestock yields and productivity have remained low since the fast-track land reform program of 2000, suggesting poor use of scarce farm inputs. Agricultural production is also at the mercy of climate fluctuations, particularly extreme weather conditions such as the 2011/12 and 2015/16 El Nino episodes that have worsened productivity and affected the agricultural exportation ZIMSTAT (2019). However, most seasons, such as 2016/17, had developed good rains. They were boosted by introducing an input support facility known as Command Agriculture, which saw the country achieving record maise output of over 2.4 million tonnes and other exportable commodities ZIMSTAT (2019).

Because of the country's excellent harvests and current steady rise to become one of the largest producers of agricultural commodities, exchange rate volatility is the main issue. Conventional wisdom is that exchange rate fluctuation significantly affects international commerce, posing a danger to the exporter's production and profits and posing a risk to traders, which ultimately causes them to make poor judgments. Consequently, the exchange rate measures are considered significant macroeconomic tools as they impact the investment choices in an economy's businesses (Chimhore & Chivasa, 2021). Exchange rate volatility and average trade have been the subject of several published empirical research. Therefore, there is ongoing discussion on the extent to which changes in exchange rates affect agricultural trade.

Before independence, agriculture in Zimbabwe was very developed. It was known as Rhodesia and boasted of being the bread basket of Africa. In 1996, Zimbabwe exported 9,500 metric tons of agricultural goods, confirming its reputation as Africa's breadbasket until the early 1990s, according to Bonga's (2019) findings. Cotton, tobacco, livestock, maise, and other agricultural products were among the net exports from the nation in the past. Horticulture, floriculture, and agriculture made up 53.7% of Zimbabwe's total exports to the EU between 1992 and 1996. Maiyaki (2010). Also, in 1998, the sugar industry was projected to transfer more than 18 million euros of income to Zimbabwe. Principal fluctuations in crop production in Zimbabwe were recorded in the 2000s when the state started implementing the land reform program, which was unreasonably adopted in the case of the distribution of land resources. Large-scale commercial farmers, mostly white farmers, had their lands redistributed to small-scale, less experienced farmers; this resulted in a significant drop in productivity, which by 2004 had dropped by 30% (Richardson, 2004). The political acts of land reforms destabilised agricultural food production, lowered productivity, and decreased exports. Factors like limited credit, lack of infrastructure investment, and political insecurity characterised the sector. Input suppliers, such as seeds, fertilisers and some farming equipment, were also not easily accessible in the agricultural sector. Since then, the government has revived farming and promoted more trade in agricultural produce. To support the farmers, the government has introduced some programs, including training, better access to loans, and rehabilitation of irrigation infrastructure (Fanadzo & Ncube, 2018).

Cotton and tobacco are Zimbabwe's most dominant agricultural export products, whereas tobacco alone represents the highest agricultural export at 12.17%. Zimbabwe exported USD1.01 billion to

South Africa in 2017 and USD170 million to China. Other principal agricultural export products are sugar and cotton, which account for 1.2% and 0.77% of the country's total exports, respectively (OEC, 2018). However, the export-led hypothesis for countries like Zimbabwe is refuted because the prices of the agricultural primary produce exported are often unpredictable; so are the resulting gains in economic growth (Gwanongodza, 2020).

The Bretton Wood system, which was put in place in early 1970, may cause significant trade disruptions because of fluctuations in currency values. Following the fall of the Bretton Woods system, countries chose to use a floating exchange rate system. According to him, unfettered cross-border integration has caused these nations' currency rates to become more volatile (Dooley et al., 2004; Chimhore & Chivasa, 2021). This research will demonstrate that Zimbabwe saw changes in agricultural production and currency rates throughout the post-independence era. As Odili (2014) shows, this link is relatively complex, including currency rates and several macroeconomic indicators, and its degree largely relies on the specifics and state of the country in question. With this in mind, Tamakwenda has noted domestic buying. Since attaining independence, Zimbabwe has used many currency rate systems, which have altered selling. Given that agriculture contributes a larger portion of Zimbabwe's export earnings, it is clear that exchange rate changes impact this industry.

Table 1. The trend in agricultural trade linking the trend and the exchange rate systems

PERIOD	EXCHANGE RATE TREND	AGRICULTURAL EXPORTS
1978-1980	Pegged to USD@ USD 1	37%
1981-1990	Fixed dual rates ZWD$17.36-USD1	44%
1991-1998	Floating exchange rateZWD$31.82-USD1	44%
1999-2003	Pegged to USD @ZWD$30-USD1	38% (IMF)
2004-2005	Auction system ZWD$302.12-USD1	27% (IMF)
2006-2008	HyperinflationZWD$400079 USD1	23% (RBZ)
2009-2019	dollarisation	45%
2020-2021	Floating and auction system ZWD$104.71-USD1	38%

Source: World Bank (2022)

Table 1 includes data on exports and imports of agricultural products, exchange rate regimes and tendencies from 1980 to 2022. A synonym for agricultural exports is the share of all exports of agricultural products from the country.

The current study aims to demonstrate how agricultural exports and exchange rate risk are related in Zimbabwe. The current state of currency rates can modify trade patterns, increase exporters' risks, and create uncertainty. Although this issue is of interest in the international literature, emphasising how it impacts commerce, limited empirical have looked at how exchange rate volatility affects agricultural exports in underdeveloped countries. This disparity is substantial since pricing risks and external shocks can quickly impact or threaten agricultural exports. Additionally, earlier research on Zimbabwe has focused only on certain crops or years, leaving out crucial studies of the changes in export crops over an extended period and across multiple trading regimes. This research fills a gap in the literature, comparing the effects of currency rate variations on Zimbabwe's agricultural exports from 1980 to 2022. Real GDP, inflation, foreign direct investment, real exchange rates, and agricultural production are all examined using the Autoregressive Distributed Lag (ARDL) model in both the short and long term. The project will cover this research vacuum by offering policy-relevant information to help Zimbabwe improve the quality and dependability of agricultural exports to promote economic transformation and growth.

2. Literature Review

The elasticity of demand for imports and exports is considered when examining the trade balance adjustment path using the elasticity approach. Miller (1955) and Robinson (1937) popularised the analysis which Alfred Marshall and Abba Lerner created. When a country's currency devalues, the elasticity method, essentially a model, analyses the demand elasticities of imports and exports. He eliminates transportation expenses from the model by establishing fully elastic supply elasticities for import and domestic export goods. As a result, demand volume and demand rate do not positively correlate with price. Therefore, the pricing problem is unaffected by changes in the demand for certain quantities. It implies that domestic and foreign prices are fixed, requiring relative pricing to be adjusted whenever the nominal exchange rate fluctuates (Mussa, 2013). According to the Marshall Lerner condition, a component of the balance of payments, the trade balance, must be raised from an equilibrium position by devaluation. This suggests that changes in relative pricing are caused by the nominal exchange rate, which also sets local and foreign prices. He asserts that when $\eta x + \eta m > 1$, as shown below, devaluation will enhance the trade balance's balance of payments:

$$\eta x + \eta m > 1$$

A core concept underlies the elasticity approach, which is that variation in relative price influences the desired quantities of goods demanded by consumers domestically and overseas, leading to variations in export and import.

2.1. The Monetary Approach

Whitman, Frekel and Johnson were the first to analyse depreciation using a monetary method (Carbaugh, 1995; Lencho, 2013). BoP is seen as a monetary phenomenon rather than an event, which is the foundation of the monetary approach to BoP. The three primary concepts of the monetary model for establishing the exchange rate are purchasing power parity, money demand function stability, and vertical aggregate supply schedule. Each nation's native currency's supply and demand are the foundation for the monetary strategy determining exchange rates. According to this approach, real income, interest rates, and the overall level of prices all influence the desire for money. It was noted that real income, money demand, and prices are all directly correlated. On the other hand, it has the opposite relationship with the interest rate. The quantity of money in circulation was determined individually by the monetary authorities of each country (Branson, 2013), according to Matoka and Chaampita (2022).

There are theories on whether base point interest parity exists in the structure of the foreign currency market. Additionally, it seems sensible to suppose that the monetary authority of the country of origin impacts an increase in the money supply. Price increases based on origin location are one of the long-term impacts, along with the depreciation of the native currency (Britton, 2010; Matoka & Chaampita, 2022).

2.2. Exchange Rate Volatility and International Trade

Huchet-Bourdon and Korinek (2011) cite De Grauwe (1988) as saying that companies' risk perceptions determine whether exchange rate fluctuations are advantageous or disadvantageous for exports. Because the marginal utility of anticipated export income is low, producers are considered somewhat risk averse as they export less when exposed to greater exchange rate risk. The worst-case scenario will be considered if they are extremely worried about the risks. This implies that any increase in the risk of exchange rates results in higher projected marginal utilities of export earnings since producers will want to increase exports much more to make up for a significant drop in them. According to Dellas and Zilberfarb (1993), De Grauwe (1988), and Broll and Eckwert (2006), two opposing factors govern how exchange rate volatility affects trade. They distinguish between two types of effects: the first is a substitution effect, which deters trade when risk rises, and the second is an income effect, which encourages companies to trade more when the overall expected utility is judged to have decreased. However, the income effect will outweigh the substitution effect if risk aversion is extremely high, and more exchange risk will result in more trade rather than the opposite, as the first equation suggests (Huchet & Korinek).

Therefore, the study by Mutodi et al. (2020) sought to determine how changes in the actual currency rate from January 1980 to December 2019 affected tobacco exports from Zimbabwe. The exchange rate volatility index in this research was calculated using GARCH-ARCH models. It was able to forecast how tobacco exports would respond to shifts in real exchange rates by using the vector error correction model used in this study. The VECM results thus also demonstrated the detrimental effect of real depreciation on tobacco exports. The actual exchange rate depreciation also eased tobacco exports in the short term. It demonstrated that, among the trades in the industrialised nation, the agricultural sector was the most sensitive to changes in exchange rates.

Permana (2022) examined how Indonesian pepper exports to key partners were affected by currency rate volatility between 2005 and 2019. Based on the aforementioned data, the gravity model and the GARCH (1,1) for the volatility estimates indicate that exchange rate volatility has no negative impact on Indonesian pepper exports. This was to be anticipated since Indonesia has been exporting this spice for the past ten years, and most of this output was eaten outside the nation.

Using the Ordinary Least Squares method, Chimhore and Chivasa (2021) examined how Zimbabwe's exports were affected by exchange rates throughout the multicurrency period. Their findings showed a correlation between Zimbabwe's exports and the exchange rate, which was indirect and significant at the 5% level.

3. Methodology

The section discusses the research methodology, data collection, variable selection, and model used. The study aims to analyse the effect of currency rate fluctuations on Zimbabwe's agricultural exports from 1980 to 2022 and the estimating technique. The methodology ensures credible and adequate replies to the study's goals.

3.1. Research Design

An exogenous quantitative research approach is used in this work to analyse yearly time series data. The design also incorporates diagnostic tests and the econometric modelling technique to determine the short- and long-term cointegration between agricultural exports and macroeconomic determinants, per the research. Owing to the variables' UR mixed feature, the estimation method uses ECM and the limits test based on first-difference data using the ARDL model.

3.2. Data Sources and Variable Description

The World Development Indicators (WDI), the Food and Agriculture Organization (FAO), the Reserve Bank of Zimbabwe (RBZ), the International Monetary Fund (IMF), and the Zimbabwe National Statistics Agency (ZIMSTAT) provided the data used in this study. The research used the following control variables:

- Agricultural Exports (AGRICEXP): expressed in terms of the percentage of the total merchandise export. Agricultural exports refer to produce grown or manufactured in Zimbabwe, then transported or shipped to another country or state for sale. Based on World Development Indicators, the study's agricultural export data consists of merchandise exports as a percentage of total exports. Much focus is also placed on farming. Production processes in every nation's region depend on agricultural raw materials (Gwanongodza, 2020). The research study's dependent variable is still agricultural product exports.
- Gross Domestic Product (GDP): an economic development metric often expressed in Zimbabwe's gross income. In a fiscal year, the gross domestic product is the total value of all manufactured goods and services produced in the nation's geographic area. It is the sum of the value of all completed commodities and services that a country produces or provides to the public. Exports are expected to benefit from a rise in GDP as they generate foreign currency, improving capital goods imports.
- Exchange Rate (EXCH): fluctuations in the Zimbabwean dollar's value concerning US dollars. In this view, the foreign currency rate indicates Zimbabwe's integration into the world economy. The opposite of a devalued Zimbabwean dollar is an increase in the currency's value. Because of the decline in exchange rates, the dollar is now worth more than the listed foreign currencies. The belief that exchange rate risk negatively affects global business is widely accepted (Permana, 2022). Nonetheless, the studies have brought up the aforementioned research issues by examining whether exchange rate fluctuation harms exports.
- Foreign Direct Investment (FDI) is an example of foreign direct investment that may increase export capacity. A proprietorship between a business or an individual in one nation and another is an example of creating commercial entities or acquiring commercial interests in another. One method that FDI helps with is technology transfer, which increases the host country's capacity to export (Blanchard, 2010). Therefore, it is thought that foreign direct investment will increase exports.
- Inflation (INFL) characterises the macroeconomic environment, the yearly percentage change in consumer prices. Fluctuations /changes/variation in inflation depicts the swings and changes in the domestic currency that may affect agricultural trade.

- Agricultural Output (AGRICOUT): the total agricultural production in tons is considered the supply-side factor. The production variable indicates the country's current year's supply of agricultural inputs. Tonnes are normally employed to measure it. The two are related in that Zimbabwe produced more in a given year than when exports were low, and Zimbabwe produced less in a year when exports were low. In this case, production within a country greatly impacts the trade, that is, import and export (Anderson, 2014).

Data gaps were also handled via interpolation for internal consistency checking, and remote sensing data accuracy was confirmed via external validation of multiple sources and diagnostics.

3.3. Model Specification

The export demand model must be adjusted to estimate agricultural exports as a dependent variable on GDP, currency rates, foreign direct investment, inflation, and agricultural output. The autoregressive distributed lag (ARDL) model was developed by Engle and Granger (1987) and provided the theoretical framework for this study. For this reason, between 1997 and 2001, Pesaran used the ARDL paradigm to promote its various benefits (Oskooee & Oyoloa, 2007). Remarkably, even when the variables are expressed as I (0) and I (1), their values are constant or after a first difference, as in our situation. In light of this, the study evaluated the ARDL model as follows: It is said that the model's functional form is:

$$AGRICEXP = \alpha + \beta_1 GDP + \beta_2 EXCH + \beta_3 FDI + \beta_4 INFL + \beta_5 AGRICOUT + \acute{\varepsilon}$$

The ARDL model is defined as follows in order to capture both short- and long-run dynamics:

$$\begin{aligned}\Delta lnAGRICEXP_t &= \propto_0 + \sum_{i=1}^{n} \beta_1\, \Delta lnAGRICEXP_{t-1} + \sum_{j=0}^{m} \gamma_j\, \Delta lnGDP_{t-j} + \sum_{k=0}^{p} \delta_k\, \Delta lnEXCH_{t-k} \\ &+ \sum_{l=0}^{q} \emptyset_l\, \Delta lnFDI_{t-l} + \sum_{m=0}^{r} \theta_m\, \Delta lnINFL_{t-m} + \sum_{n=0}^{s} \varphi_n\, \Delta lnAGRICOUT_{t-n} \\ &+ \lambda ECM_{t-1} + \varepsilon_t\end{aligned}$$

Where denotes first differences, $ECM_{t-1}$is the error correction term, and ε_t It is the error term.

When the intercept terms α and ∝_0 are present, Short-run coefficients are β_1, γ_j, δ_k,∅_l,θ_m,φ_n; long-run coefficients are β_1, β_2, β_3, β_4, and β_5; lag lengths are n and m; difference operator is Δ; white noise error terms are ε and ε_t; and The Error Correction Model (ECM) measures the rate at which short-term shocks are adjusted back to the long-term equilibrium.

3.4. Estimation Procedure

1. Stationarity Testing: ADF tests were conducted to determine each variable's I (D) order. This step also helps to ensure that the ARDL model is right.

2. ARDL Bounds Testing: The bounds test reveals the stationarity of variables and establishes long-run connections amongst them. First, the null hypothesis of no cointegration is being compared with the alternative hypothesis.

3. Error Correction Model (ECM): The ECM elucidates the speed at which short-run fluctuations return to the long-run equilibrium with a negative and significant coefficient on the error term.

3.5. Analytical Tools

The analysis was performed using Stata software, which provides comprehensive ARDL estimation and diagnostic testing tools.

3.6. Justification for the ARDL Approach

The ARDL method is selected for its advantages in analysing long- and short-run relationships in small sample sizes and its ability to handle variables with mixed stationarity. Unlike the ordinary cointegration techniques, the ARDL technique does not imply testing the variables for the presence of unity at the same level. This multiphase approach reduces the likelihood of errors in the study results while crediting the analysis by applying a coherent and sound analytical paradigm. The study's findings provide policy suggestions about how exchange rate volatility affects the country's agricultural commodity exports.

4. Empirical Results

ADF allowed for determining whether the autocorrelation coefficient value is constant and if the mean and variance coefficients in a particular time series are constant. Due to the aforementioned finding, before performing the ARDL bound test, it is necessary to verify that all of the variables utilised in the model-independent and dependent—are stationary. In order to ascertain if the variables in I(0) or I(1) are stationary, unit root tests were also conducted utilising stationarity and bound tests. However, the null hypothesis, which states that the variables are non-stationary, may be rejected if the ADF test statistics value is higher than the value in the table. This demonstrates that a time series has no movement. That is, if the absolute value of the ADF test statistic falls below the critical 5% threshold, the null hypothesis cannot be rejected. Consequently, the time series in question is not stationary.

Table 2. Stationarity Test Results

Variable	ADF Test Statistic	5% Critical Value	Integration Order
Agricultural Exports (AGRICEXP)	-6.019	-3.580	I(1)
GDP	-6.204	-3.580	I(1)
Exchange Rate (EXCH)	-3.760	-3.576	I(0)
Foreign Direct Investment (FDI)	-5.910	-3.580	I(1)
Inflation (INFL)	-3.866	-3.576	I(0)
Agricultural Output (AGRICOUT)	-7.543	-3.228	I(1)

Because the ARDL model supports this kind of integration order, it can be deduced from the preceding results that the variables combine I (0) and I (1). The test argues that the data set is stationary. In contrast, the so-called alternative hypothesis asserts that the ADF null hypothesis, which assumes the existence of the unit root, is non-stationary (Kripfganz and Schneider, 2023). Although 6.019> -6.019 _{-3.580}, the I(1) least squad first difference is AGRICEXP based on the facts above. Secondly, regarding absolute, Table 2 reveals that, in the mean period, the currency rate and inflationary variables were stationary at the level. In contrast, the first stationary differences were agricultural exports, gross domestic product, foreign direct investment, and agricultural production.

Table 3. ARDL Bounds Test for Cointegration

Calculated values	Critical values	
Statistics	Lower bond I(0)	Upper bound I (0)

F-statistic	6.305	2.26	4.68
T-statistic	-3.108	-2.57	-4.79

H0: no levels relationship

Source: stata Output

The variables are in long-term equilibrium when the F-statistic is greater than the upper end. If there is cointegration and the t-statistic is less than the lower limit, or if the F-statistic is higher than the I(1) regressors (upper limit), we reject the hypothesis. Nothing can be done, however, if the computed F statistic drops below the threshold level. Consequently, we cannot support the null hypothesis, which states that there is no cointegration and that the markets only have a short-term relationship (Mufana, 2016). The unit root result above and the ARDL limits test analysis demonstrate that the computed F-statistic is larger than the test's top restriction at 4.68, as shown by 6.305**. The outcome disproves the null hypothesis by confirming that the model's variables are in a long-run cointegration equilibrium. Srinivasan and Kalaivani (2013) assert that these two series must be quite far from one another in order for them to proceed separately. The variables' cointegration also implies the presence of a short-term interaction mechanism that stops the error terms of long-term connections from steadily growing in magnitude.

4.1. Long-Run and Short-Run Estimates of the ADRL Process

Table 4. Long-Run Coefficients

Variable	Coefficient (β)	Standard Error	t-Statistic	p-Value
GDP (lnGDP)	-0.0181	0.0115	-1.57	0.155
Exchange Rate (lnEXCH)	-0.0204**	0.0121	-1.69	0.013
FDI (lnFDI)	1.2483	1.6255	0.77	0.465
Inflation (lnINFL)	-1.2901***	7.6701	-1.69	0.103
Agricultural Output (lnAGRICOU)	5.2801	1.1001	0.48	0.644

****denotes significance at 1%, **significance at 5% and *significance at 10%*

Exchange rate volatility (lnEXCH) negatively and statistically significantly affects agricultural exports in the long run (p=0.013). Inflation (lnINFL) also significantly negatively impacts agricultural exports (p=0.103), indicating the destabilising effect of macroeconomic instability; these results are consistent with (Kandilov, 2008). GDP, FDI, and agricultural output were not significant in the long run, highlighting other structural challenges in Zimbabwe's export environment.

Table 5. Short-Run Coefficients (Error Correction Model)

Variable	Coefficient (γ, ϕ)	Standard Error	t-Statistic	p-Value
ΔlnGDP	0.0140	0.0050	2.77	0.024
ΔlnEXCH	0.0125	0.0522	2.39	0.044
ΔlnFDI	-1.7140	0.6568	-2.61	0.031
ΔlnINFL	-8.5000	3.2600	-2.61	0.031
ΔlnAGRICOUT	3.7100	5.4900	0.68	0.518
Error Correction Term ($\boldsymbol{ECM_{t-1}}$)	-0.6263	0.2015	-3.11	0.014

The high rate of the short-term market-equilibrating mechanism is confirmed by the statistically significant finding at the 1.4% level when the error correction term equals -0.6263. Exchange rate (ΔlnEXCH) and GDP (ΔlnGDP) thus reveal signs of positive short-run influence on agricultural exports, suggesting that agricultural exports are sensitive to changes in macroeconomic variables.

The findings imply that there are long-term detrimental effects of exchange rate fluctuation. Long-term fluctuations in currency rates threaten profit and certainty and deter export transactions, according to the significant exchange rate volatility coefficient that is negative. De Grauwe (1988) asserts that currency risk reduces export volumes, particularly for very risk-sensitive exporters. Over time, it also suggests a negative sign, meaning that a 2% decrease in agricultural exports will result from a percentage change in the exchange rate. These results support the findings by Chimhore and Chivasa (2021). Sandu and Giba (2021) noticed this in the impulse response function, as did Chimhore and Chivasa (2021). They pointed out that a shock in the exchange rate reduces agricultural exports after two periods. Risk-averse producers will shift to non-traded products, leading to a fall in exports. At the same time, it has a positive Short-Run Impact. The positive short-run coefficient implies that temporary exchange rate depreciations may boost exports by making them more competitive. However, exporters' inability to hedge long-term risks diminishes these gains over time.

The equation above illustrates how increased production costs impact agricultural exports over the long run due to inflation. Agricultural product output and exports are negatively impacted by inflation, according to Shayanewako (2016). These findings corroborate them. The results indicated that agricultural exports and inflation were negatively correlated over the long run; agricultural exports would fall by twelve percentage points for every percentage point rise in the inflation rate. Excessive inflation not only benefits manufacturing costs but also reduces the economy's buying power of money. This can be explained by the fact that excessive inflation lowers the value of money and increases production expenses. While it had more profound effects on a drop in agricultural exports, this was consistent with the inflation study conducted by Shayanewako (2016).

The short-term beneficial effect of GDP indicates that agriculture export commerce benefits from economic expansion and enhanced infrastructure and capacity. In the long run, insignificance might be a symptom of structural obstacles to export growth. The coefficient analysis's result and the GDP's positive sign show how economic growth helps increase agricultural productivity for export results.

Due to the possibility that FDI will not flow into export-boosting sectors, the short-term negative aspect of the results could result from employing the incorrect channel for encouraging exports. Productivity in Agriculture: These data imply little change in the medium and long term, which may indicate problems turning increased output into supply that can be exported.

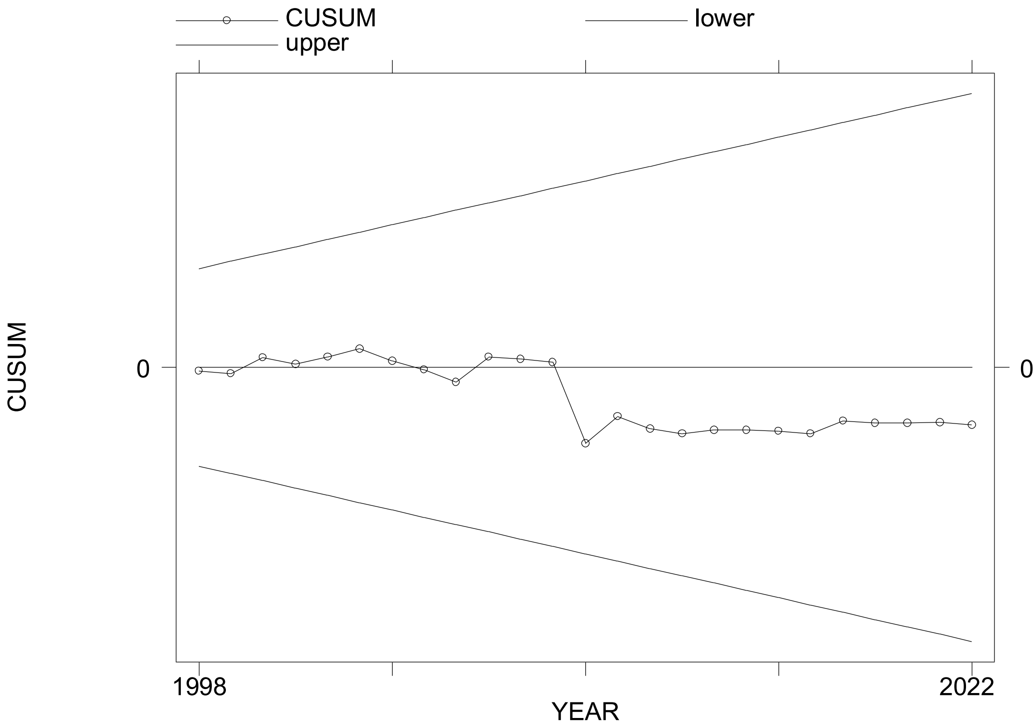
The Error Correction Term, or ECMt—1, is a parameter that illustrates how a model reconstructs the long-term relationship between variables after correcting for a short-term shock. The ECMt−1 is equal to -0.6263. With a negative and significant coefficient ($p=0.014$), the current era has adjusted for around 62.63% of the disequilibrium from the previous time. This, in turn, indicates a moderate speed of adjustment, as this suggests that although the agricultural export sector reacts to shock, it does not do so completely within one period. On this basis, the need for policy initiatives that increase the sector's flexibility and stability in the context of fluctuations in macroeconomic indicators is emphasised.

Table 6. Diagnostic test results for the agricultural export model

test	Test statistic	p-value
Ramsey reset test	0.90	0.4567
White test	29.0	0.5692
Durbin Watson	2.803	0.0941

Post-estimation analysis has allowed for the validation of the ARLD-Error Correction Model; specifically, probability statistics at $p < 0.0005$ levels of significance showed that the null hypotheses were accepted against all possible model problems. The Ramsey RESET test leads us to conclude that there are no indications of a specification error in the model we have used. Sadly, the null hypothesis—which maintains that there is no specification mistake and white noise residuals—cannot be disproved by insignificant test statistics. We reject the null hypothesis as the previously indicated diagnostic tests yielded a p-value of $0.038<0.05$, indicating that the data is heteroscedastic. According to the Ramsey reset test, the model has no missing variables.

Recursive residuals were also employed in using the Cumulative sum (CUSUM) test to determine parameters' stability. As shown in the figure below, the parameters are constant at the 5% significance level over time since the cumulated sums have not crossed the area between the critical lines.



The study data was collected from WDI, FAO, IMF, ZIM Agric worksheet and micro trends. The result from the ADF test, which shows that Agricexp, GDP, FDI and agricout integrated at order 1 while the other two variables are stationary at the level provided the backing to this. Furthermore, the estimators of the long-run and short-run ARDL model also supported the fact that the coefficient of exchange rate volatility was negative and statistically significant in the long run and positive in the short run. The results of the ARDL bound tests supported the existence of the long-run equilibrium relationship among the variables. Further, the present study has confirmed that the inflation coefficient has a negative and statistically significant impact on agricultural exports in both the short-run and long-run models. GDP, FDI, and agriculture played a role, whilst in the short run, they did not play any significant role in the long run. Overshooting in agricultural export returns to the long-term equilibrium caused 22% of the persistence in previous years to be lost in the year of the shock, according to the speed of adjustment term.

To the best of the author's knowledge, this work contributes to the following areas of research: First, it offers a comprehensive method for figuring out how exchange rate changes affect a developing country's agricultural exports immediately and over time. It builds on prior works (Mutodi et al., 2020) but underscores Zimbabwe's context issues, as policy uncertainty combined with the underdeveloped financial structure increases long-run risks. These findings provide policymakers with valuable information and contribute to the worldwide discussion on trade and exchange rates in nations that rely heavily on agriculture.

5. Conclusion

The first objective of the study was to establish the influence of exchange rate changes on Zimbabwean agricultural exports for the period 1980 – 2022; second, to assess the short and long-run agricultural exports; and, third, other macroeconomic variables like GDP, exchange rate, inflation rate, FDI, and agricultural output. Applying the obtained ARDL model and ECM, the study showed cointegration between the variables and a long-run relationship between them. Moreover, the evidence also favours the predicted inflation and other macro variables and the net impact of ERV, which the theory says has a positive early impact but negative later on. Further, it contributes to the theory knowledge of exchange rate concerns' impact on short- and long-term commerce. Additionally, it shows how much commerce is impacted by exchange rate swings. They show how exchange rate risk affects substitution, income efficiency and elasticity, and the monetary approach to trade balance between developing nations. These results align with the risk aversion paradigm established by De Grauwe (1988). Integrating theory with empirical findings enriches the literature on trade volatility in agriculturally sensitive countries.

Economic and Policy Implications

- Hedging Mechanisms: Policies to promote financial instruments for hedging exchange rate risks are essential to stabilise long-term export earnings.
- Inflation Control: Macroeconomic stabilisation policies, such as inflation targeting and fiscal discipline, are crucial to reducing production costs and restoring export competitiveness.
- Infrastructure Development: There is a need for investment in transportation, storage and processing facilities to close the supply-export gap in agriculture.
- Export Diversification: Diversification away from further concentration on primary agricultural export means that the adverse impacts of price and exchange rate fluctuations might be addressed by producing value-added products.

References

Anderson, K. (2014). Globalisation and agricultural trade. *Australian Economic History Review,* 54, 285-306.

Blanchard, E. J. (2010). Reevaluating the role of trade agreements: Does investment globalisation make the WTO obsolete? *Journal of International Economics,* 82, 63-72.

Bonga, W. G. (2019). *Stock market volatility analysis using GARCH family models: evidence from Zimbabwe stock exchange*. MPRA Paper.

Branson. (2013). Exchange Rate Dynamics and Monetary Policy. *Economics Review*.

Britton. (2010). The Dynamic Stability of the Foreign-Exchange Market. *Economic Journal*.

Broll, U., & Eckwert, B. (2006). Transparency in the foreign exchange market and the volume of international trade. *Review of International Economics,* 14, 571-581.

Chimhore, M., & Chivasa, S. (2021). The effects of exchange rates on Zimbabwe's exports. *Journal of Economics and Behavioral Studies,* 13, 8-16.

Dooley, M. P., Folkerts-Landau, D., & Garber, P. M. (2005). *Interest rates, exchange rates and international adjustment*. National Bureau of Economic Research, Cambridge, Massachusetts, USA.

Edwards, S. (1998). *Capital flows, real exchange rates, and capital controls: some Latin American experiences*. National Bureau of Economic Research, Cambridge, Massachusetts, USA.

Engle, R. F., & Granger, C. W. (1987). Cointegration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 251-276.

Fanadzo, M., & Ncube, B. (2018). Challenges and opportunities for revitalising smallholder irrigation schemes in South Africa. *Water SA,* 44, 436-447.

Grubel, H. G., & Grubel, H. G. (1976). *Domestic origins of the monetary approach to the balance of payments*. International Finance Section, Department of Economics, Princeton University.

Gwanongodza, T. (2020). *Agricultural exports and economic growth in Zimbabwe.* Stellenbosch University.

Huchet-Bourdon, M., & Korinek, J. (2011). *To what extent do exchange rates and their volatility affect trade?*

Kandilov, I. T. (2008). The effects of exchange rate volatility on agricultural trade. *American Journal of Agricultural Economics,* 90, 1028-1043.

Kripfganz, S., & Schneider, D. C. (2023). ARDL: Estimating autoregressive distributed lag and equilibrium correction models. *The Stata Journal,* 23, 983-1019.

Machlup, F. (1955). Relative prices and aggregate spending in the analysis of devaluation. *The American Economic Review,* 45, 255-278.

Maiyaki, A. A. (2010). Zimbabwe's agricultural industry. *African Journal of Business Management,* 4, 4159.

Mufana, I. S. (2016). *Exchange rate volatility and export growth in Zambia, the case of tobacco 1992-2014.* University of Zambia.

Mussa, M. (2013). The exchange rate, the balance of payments, and monetary and fiscal policy under a regime of controlled floating. In *The Economics of Exchange Rates (Collected Works of Harry Johnson).* Routledge.

Mutodi, K., Maziriri, E. T., & Chuchu, T. (2020). The response of Zimbabwe tobacco exports to real exchange rates volatility: 1980–2019. *Journal of Agribusiness and Rural Development,* 2.

Nasrullah, M., Rizwanullah, M., Yu, X., Jo, H., Sohail, M. T., & Liang, L. (2021). Autoregressive distributed lag (ARDL) approach to study the impact of climate change and other factors on rice production in South Korea. *Journal of water and climate change,* 12, 2256-2270.

Odili, O. (2014). Exchange rate and balance of payment: An autoregressive distributed lag (ARDL) econometric investigation on Nigeria. *IOSR Journal of Economics and Finance,* 4, 21-30.

Permana, B. L. D. I., & Rifin, A. (2022). The Exchange Rate Volatility Impact on Agricultural Trade: An Evidence From Indonesian Pepper Export. *Jurnal Manajemen & Agribisnis,* 19, 12-12.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics,* 16, 289-326.

Profile, C. (2011). *Zimbabwe. Global UNIDO Project: Strengthening the local production of essential generic drugs in least developed and developing countries*. United Nations Industrial Development Organization Vienna.

Robinson, J. (1937). The foreign exchanges. *Essays in the Theory of Employment,* 2.

Sandu, C., & Ghiba, N. (2011). The Relationship between Exchange Rates and Exports in Romania using Vector Autoregressive model. *Annals University Apulensies Series Oeconomica, 2*(13), 1-16.

Shayanewako, B., Chuzu, E., & Ntuli, A. T. (2016). The Impact of Hyperinflation on the Agriculture Sector. *Economic Management in a Hyperinflationary Environment: The Political Economy of Zimbabwe, 1980-2008,* 54, 125.

Srinivasan, P., & Kalaivani, M. (2013). *On the temporal causal relationship between macroeconomic variables: empirical evidence from India*. MPRA Paper.

Were, M. N. (2002). *Analysis of Kenya's export performance: An empirical evaluation*. Discussion paper No.22. Kenya Institute for Public Policy Research and Analysis. http://pdf.usaid.gov/pdf_docs/Pnads073.pdf

World Bank. (2024). *Zimbabwe trade balance, exports, imports by country and region 2021*. http://www.worldbank.org

Zimstat. (2019). *Zimbabwe Small holder Agricultural Productivity Survey 2017 report*. www.zimstat.co.zw