THE EFFECT OF BALANCE OF PAYMENT COMPONENTS ON EXCHANGE RATE DYNAMICS IN UGANDA 2014 -2024

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UGANDA CHRISTIAN UNIVERSITY

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Declaration

I, Kalyango Isaac, hereby certify that this dissertation is my original work and has been submitted in partial fulfilment of the requirements for the award of the Bachelor of Science in Economics and Statistics degree at Uganda Christian University. It has been submitted not to any other academic institution for any award. Where the work of others has been used, it has been fully acknowledged through proper citations and clear references

Signature: .....

Date: May 25, 2026

Approval

This is to certify that the research reported by Kalyango Isaac, M23B34/016 titled "The effect of Balance of payment components on Exchange rate dynamics in Uganda. (2014-2024)", has been carried out under my supervision and is hereby approved for submission to the School of Business in partial fulfilment of the requirements for the award of the Bachelor of Science in Economics and Statistics degree at Uganda Christian University.

Signature: .....

Date: May 25, 2026

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Dedication

I dedicate this study to the scholars, policy makers that endeavor to make sense of the fragile point between theory and implementation in Uganda. Let this paper be of great knowledge and insight to how we can affect serious policy change in the economy to help it grow. May these findings serve as a stepping stone to improve on the formal sector to improve our export businesses so as to reduce our import burden. Above all, let this paper show you how we can affect change and in turn increase our GDP and stabilize the economy so that every Ugandan can enjoy the benefits of living in the country.

Acknowledgments

Firstly, I thank God Almighty because His mercy and love have been shown to me in different ways and circumstances and he has held my hand through this period. I would like to thank my parents. My Mother and Father, through your support and belief system, I have been able to make it through. Dad through your vast knowledge of the economy as a researcher, you have been a great help to me not only for inspiration but a source of knowledge. I do this not for only my gain but for yours as much.

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Abstract

The study assesses the short and long-run impact of the components of the Balance of Payments (BOP) on the exchange rate dynamics in Uganda for quarterly data from 2014Q1 to 2024Q4 (n=44 observations). The study is driven by the fact that Uganda has been facing persistent current account deficits (CA deficit) averaging at 7.9 percent of GDP during the study period, the choice of floating exchange rate regime by Bank of Uganda, the frequent foreign exchange shortage crises, and the imminent transition to commercial oil production. In combination, these factors make a case for using exchange rate stability as the core focus of macroeconomic policy. The study uses an Autoregressive Distributed Lag (ARDL) bounds testing approach to estimate an ARDL(3,3,3,3) error-correction model of the log nominal UGX/USD exchange rate (lnNER) using three regressors retained after conducting the tests for multicollinearity namely, net exports as a percentage of GDP (NX), net Foreign Direct Investments as a percentage of GDP (FDI), and consumer price inflation (INF). The volatility properties are analysed following a GARCH(1,1) specification, while the dynamics between the variables are explored by a VAR(2) specification of the variables, and pairwise Granger causality tests. The bounds test confirms the cointegration ($F = 4.819$, higher than the upper critical bound of the 5 per cent for the test). The error correction term (ECT) is statistically significant and correctly signed, and means that around 18.6 percent of any short-run imbalance is corrected in each quarter, with the complete adjustment taking place in about 5.4 quarters. Also, in the short run, FDI appreciates by two quarters, which is in line with the portfolio balance theory (coefficient = −8.158, $p = 0.003$), whereas lagged inflation causes depreciation (coefficient = 0.011, $p = 0.024$), consistent with the Purchasing Power Parity hypothesis (PPP) that higher inflation erodes the external value of currency. The GARCH(1,1) estimates suggest $\alpha + \beta = 1.043$, suggesting that the volatilities are nearly always present due to episodic shocks to external factors, in particular the depreciation in 2015, the COVID-19 disruption and the global surge in commodity prices in 2022. The Granger causality results show that inflation has a significant effect on the causality of net exports ($\chi^2 = 7.384$, $p = 0.025$) and has strong bidirectional relationship with NX and INF, and weaker bidirectional relationship with NX and exchange rate, but none of the individual BOP variables Granger-causes lnNER at the conventional significance level, which supports the exchange-rate disconnect literature. The residuals diagnostics show that the model is adequate (Breusch–

Godfrey p = 0.189, White p = 0.427, Jarque–Bera p = 0.508, Ljung–Box p = 0.109). The results indicate that the Bank of Uganda needs to adopt a coordinated policy mix of export diversification, inflation targeting and prudent management of foreign reserves to stabilise the shilling in the country's transition to becoming an oil producer.

List of abbreviations

ADF – Augmented Dickey-Fuller
AfDB – African Development Bank
ARDL – Autoregressive Distributed Lag
BoU – Bank of Uganda
BOP – Balance of Payments
CPI – Consumer Price Index
EAC – East African Community
ECT - Error Correction Term
ECM - Error Correction Model
EDS – External Debt Service
EXVOL – Exchange Rate Volatility
FDI – Foreign Direct Investment
GDP – Gross Domestic Product
GIR – Gross International Reserves
GARCH – Generalized Autoregressive Conditional Heteroskedasticity
IMF – International Monetary Fund
INF – Inflation Rate
NER – Nominal Exchange Rate
REM - Remitances
TB – Trade Balance
UBOS – Uganda Bureau of Statistics
UGX – Uganda Shilling
USD – United States Dollar
VECM – Vector Error Correction Model
VIF - Variance Inflation Factor

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CHAPTER ONE: INTRODUCTION

1.0 Introduction

In open economies such as Uganda, the balance of payments (BOP) and exchange rate stability are very important, particularly those countries who depend on foreign money (Oseku & Paul, 2013) and imports. Uganda is an illustrative case through which to view the situation dynamics. For instance, 2023 is the year that Uganda had a current account deficit of around US$3.77 billion, which amounts to 7.9% of GDP (Trade Economics, n.d.). External imbalances (Trading Economics, n.d.) are further exacerbated by reliance on exports of vulnerable commodities and high import needs, in particular for the petroleum and capital components.

In addition, the exchange rate in Uganda during troubled times has also fluctuated rapidly, with inflation rising and posing challenges for the country's financial plans. sheet vulnerabilities. External buffers are under increasing strain. According to an International Monetary Fund analysis, between June 2023 and January 2024, Uganda's foreign exchange reserves fell by approximately 12%, falling from an estimated US$4.07 billion, approximately 3.4 months of import cover minus on oil projects. (Reuters, 2024;IMF, 2024). Future oil sector prosperity and FDI growth expectations will likely create a major shift in Uganda's balance of payments and exchange rate in the years to come (Reuters, 2025). Yet delays, erratic money flows, remittance reversals, low reserves and the servicing of external debt by the country, and adverse conditions in the global (Reuters, 2025) financial market might make matters hard to navigate again.

Due to these challenges, it is vital to study how diverse factors of the balance of payments components, including trade balances, FDI, remittances, reserves, and external debt, contribute to exchange rate (Reuters, 2024) behavior (Tumusiime - Mutebile & Emmanuel, 2015) in Uganda. Consequently, this work analyzes how the Uganda balance of payments have affected the exchange rate trajectory over the last decade (Tumusiime - Mutebile, 2015) drawing fresh data and real instance drawn from Uganda recent data and structural changes.

1.1 Background of the study

The BOP covers all economic transactions between Uganda and the external world and includes the current account (IMF, 2025) account (trade in goods and services, primary income, transfers) as well as the capital account and financial account. In a country similar to Uganda, with trade liberalization and foreign monetary reliance and financial dependence (Reuters, 2024), the impact of BOP can greatly influence exchange rates. Uganda has had current account deficits for several years in the past. As of 2023 this was estimated to be approximately 7.9% of GDP, highlighting Uganda's (Trading Economics, 2023) continuing trade deficit and dependency on imported and foreign resources to fill the deficit gap (World Bank Group, 2023). In 2024, these large deficits still persisted, with estimates approaching 9.2% of GDP (Trading Economics, 2025). Such a chronic deficit shows how much Uganda spends on imports continues to exceed what the country makes from exports, remittances and other monetary flows into the country.

The trade account is one of the main drivers of the deficit. Uganda's trade allocations have also consistently had a negative balance. For instance, the nation recorded a total monthly trade deficit of about US$515.9 million in June 2025 (export minus imports) in trade based on trading data (Trading Economics, 2025). Cumulative yearly figures at the same time show that Uganda's imports far surpass exports and that the trade gap has widened significantly. This structural trade gap is aggravated (Uganda Bureau of Statistics, 2025) by insufficient diversification of exports, strong reliance on raw material resources and unstable commodity prices (World Integrated Trade Solutions, 2025)

From a financial point of view, Uganda's external economy depends on its capital and financial inflows, primarily from FDI, foreign aid, remittances and debt. These inflows can however be volatile and subject to active foreign investment inflows and outflows as can be seen from BOP gap in its varying degrees (CEIC Data, 2025). Those pressures manifest themselves in the exchange rate. Foreign exchange reserves in Uganda, as a resource cushion against shocks from outside have taken a hit recently. Reserves fell by around 12% between June 2023 and January 2024, from US$4.07 billion to US$3.58 billion, providing an approximate of 3.4 months of import cover (excluding oil imports) and a drop below targeted targets of central banks (Reuters, 2024). Reserves are recovering in 2025, reaching their peak level of US$4.07 billion in May 2025 and nearing the level at later dates (FXEmpire, May 2025). Certain mid-2025 reports put reserves at

US$4.3 billion (3.8 months of import cover), indicative of some recovery (CNBC Africa, 2025). Although past long-term historical series reveals a series of stable downward trends of UGX/USD nominal exchange rate through 2019 and previous periods the short-term data also indicates depreciation trajectory of 2025 between 3,485 to 3,700 UGX per USD range and intraweek price fluctuations (FRED, 2021). The public debt dynamic also enters into play in Uganda. In 2024, the government debt to GDP ratio in Uganda was around 51.8%, which indicates that the country needs foreign exchange currency terms external debt servicing (Trading Economics, 2025). Large increases of gold export volumes, meanwhile, have also featured prominently. Only last year, the gold export to Uganda surged which is a source of foreign exchange inflow, but a large part of the increase is mainly due to resale on the processing operations (Reuters, 2024) not fully stabilizing the underlying BOP. The external environment is complicated for Uganda because of these structural factors, namely the ongoing trade deficits and reliance on shaky foreign financing, low levels of reserves, and exchange rate volatility. The empirical analysis, debt and reserves which determinates exchange rate behavior still are limited in the Ugandan context. This study addresses this and aims at examining the relationship between fluctuations in the BOP and the exchange rate situation in Uganda in recent years.

1.2 Problem statement

In Uganda, previous external imbalances have been persistent, notably through current account deficits which are close to 9.21% of GDP by 2024 (Trading Economics, 2025). An imbalance in import requirements and export receipts is suggested by the structural trade deficit which was mainly a result of exports of fuel and capital goods. These chronic shortages continually put pressure on foreign exchange rates. Uganda's foreign exchange reserves from June 2023 to January 2024 decreased from US$4.07 billion to US$3.58 billion, a mere 3.4 months of international import cover, below the central bank's prudent targets (Reuters, 2024). In this case principal channel of adjustment is exchange rate. The more frequently the depreciation happens, the more expensive imports will be, inflation will increase, and the value of foreign debts in local currency will rise. Conversely, a sudden influx of foreign currency, for example through export of

commodities or foreign investment, can temporarily strengthen the currency and can generate instability and/or overvaluation but also weaken export profitability.

Nevertheless, there is limited empirical study in Uganda notwithstanding these external pressures. Current literature, however, tends to consider trade balances (or monetary policy effects) to a certain extent and does not systematically consider how fluctuations in the whole price-adjustment toolbox (BOP), at all levels, shape exchange rate movements. The methodological gap restricts policymakers to forecast exchange rate dynamics, develop targeted interventions and promote external sector resilience. The lack of a strong grasp of the mechanisms through which exchange rates rise and fall due to the oscillation of BOPs makes Uganda vulnerable to external shocks, volatility in the exchange rate, a rise in inflation and debt service burden.

1.3 Purpose of the study

This study primarily aims to look into Uganda's BOP (MoFPED, 2024) structure and the connection to the exchange rate management over the last decade (FY 2014 to 2024). During the two major phases of the study, Uganda's resilience shall be appraised. They investigate the impact of the government response against these shocks. The first phase: an investment period driven by infrastructure-led (2014–2019), large-scale projects with increase of imported demand and borrowing from abroad.

The second phase is the period of investment (2020-2024) of the oil capital expenditure, during which oil sector investment has increased. Through studies of these phases we identify vulnerabilities, such as the decrease in foreign exchange reserves or foreign debt accruals, that might be introduced and suggest policy responses to address these vulnerabilities since Uganda is transitioning to an oil-exporting economy. The hope is to bolster the external economy and stabilize exchange rates to contain inflation, debt pressure and increased import costs. of running weak foreign exchange, or taking on too much debt, and propose policies that could help manage those risks particularly as Uganda moves into oil exports. The aim is to reinforce the external sector and stabilize the exchange rate so that inflation, debt burden or import costs are not insurmountable.

1.4 Objectives of the study

1.4.1 General objectives

To analyze how fluctuations in Uganda's BOP components affect exchange rate dynamics over recent years, to inform policies for stronger external sector resilience and exchange rate stability.

1.4.2 Specific objectives

1. To analyze the short run and long run effects of the current account balance on the Ugandan shillings exchange rate.
2. To assess the influence of capital and financial account inflows (such as FDI, portfolio investment, remittances) on exchange rate volatility.
3. To examine the short run effect of inflation on the Ugandan Shilling exchange

1.5 Research questions

1. How do fluctuations in Uganda's trade balance influence the exchange rate of the Ugandan shilling?
2. To what extent do capital inflows moderate or amplify exchange rate volatility in Uganda?
3. What is the short run impact of inflation on the Ugandan shilling exchange rate?

1.6 Research hypothesis

H_{01} Fluctuations in the trade balance have no significant effect on the exchange rate of the Ugandan shilling.

H_{11} Fluctuations in trade balances have a significant effect on the exchange rate of the Ugandan shilling.

H_{02} Capital inflows do not moderate or amplify exchange rate volatility.

H_{12} Capital inflows moderate exchange rate volatility.

H_{03} Inflation has no significant short run on the exchange rate of the Ugandan shilling

H_{13} Inflation has a significant short run effect on the exchange rate of the Ugandan shilling

1.7 Justification of the study

Hence this study is significant since Uganda's external sector continues to be extremely vulnerable. The country's reserves for foreign exchange have descended to critically low levels, while increasing public debt has largely gone towards financing projects which do not directly produce foreign exchange. This poses risks on the stability of the exchange rate as well as the economy at large. Reflecting on the 2015/16 exchange rate crisis, one can clearly see that poor management of external pressures can lead to high currency devaluation, high inflation and sudden instability. As we head into the 2026 election cycle, the same dangers can reappear if the BOP is not managed with due diligence.

This is also a forward looking study. Uganda is about to enter a new stage of oil production, which should help the country's external balances via new export income. The transaction, however, comes with risk as well: Dutch disease risks, for example, may occur from a wave of foreign exchange transactions which may make other exports less competitive. Oil's anticipated benefits could be eroded without solid institutions and rigorous policy discipline. Drawing on the lessons learnt from past trends, current vulnerabilities and concerns, this paper aims to offer practical lessons learned on how to stabilize the exchange rate and build resilience as Uganda moves towards the oil era.

1.8 Scope of the study

This study aims to assess how changes in Uganda's BOP will impact the actions from the exchange rate of the Ugandan shilling. It looks at the relationship between major components of the BOP at that same period, such as the trade balance or FDI, remittance, external debt, foreign exchange reserves, and movements in the exchange rate.

1.8.1 Time scope

The time scope is that for which this study will take place: from 2014 up to 2024. This period has been chosen because it describes two key economic phases in Uganda, i.e., the infrastructure investment phase of 2014 to 2019. Heavy external borrowing to finance large projects such as Karuma Hydropower Project, funded by the government of China $1.7 billion (NS Energy, 2018), and a large number more is another characteristic of this period.

1.8.2 Geographical scope

Geographically, the study refers to Uganda as a whole, using data, national macro-economic published by the BOU, UBOS, Ministry of Finance, Planning and Economic Development, and such international institutions as World Bank or IMF.

1.8.3 Thematic scope

The research covers only macroeconomic relationships thematically. It is not analyzing micro level firm data or household exchange rate effects and macrolevel data of firm level or household exchange rate effect not micro level. The findings are to guide national policy on management of the exchange rate, sustainable debt and stability of the external sector.

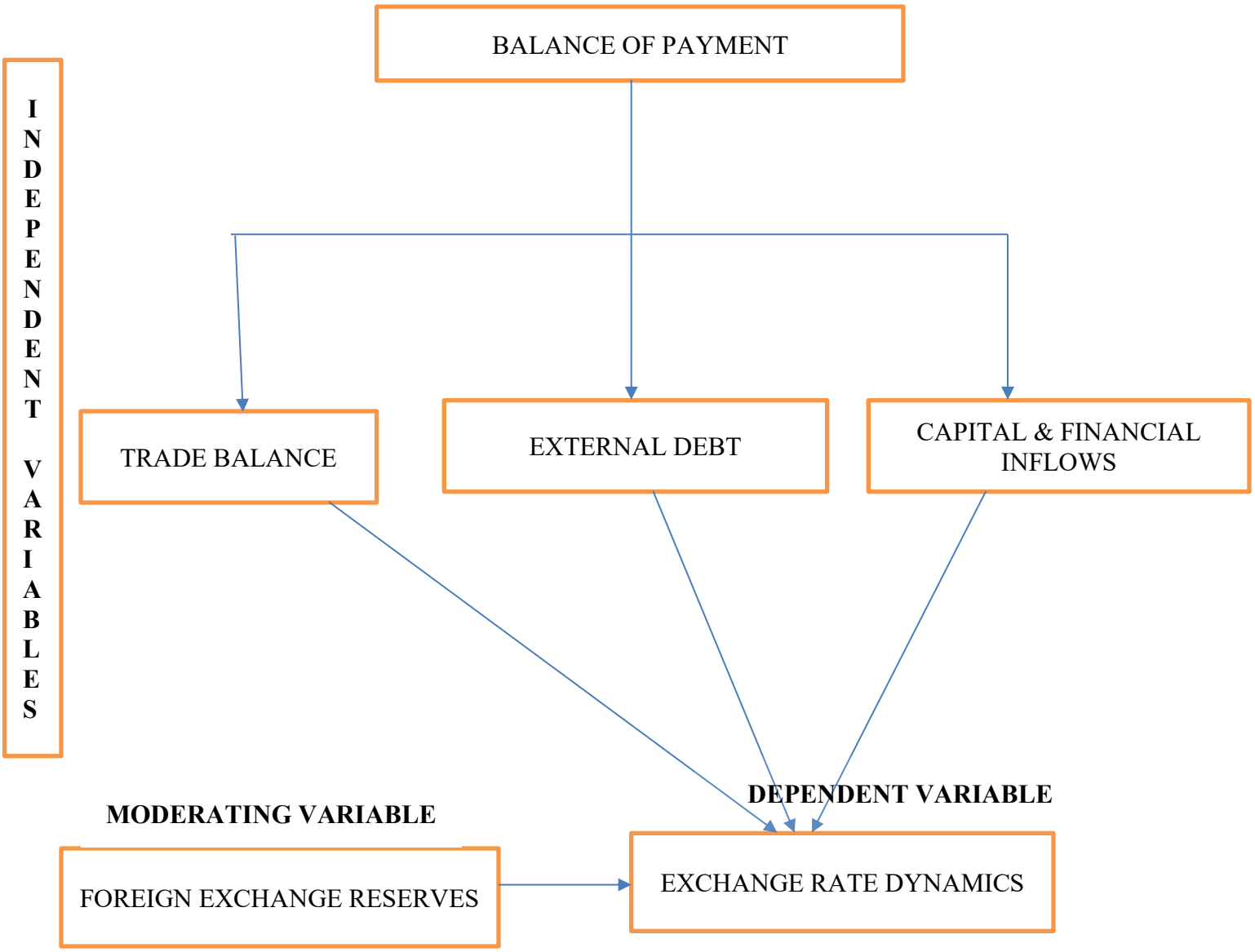
1.9 Significance of the study

These observations should be meaningful to the public in three crucial ways: to people of general knowledge about: how Uganda's BOP has an impact on the movements in the exchange rate; which are unexplored but the cornerstone of the external policy's stability; and to the public because they look at the relationship between current account deficits, FDI inflow, borrowing, and the exchange rate. The research contributes to explaining the transfer of the macrosystem to the macroeconomic structure that influences Uganda's economic growth.

For policymakers, the study exposes how an imbalance in the BOP can induce exchange rate volatility, which in turn can induce an inflationary impact with adverse effects on the economy, debt sustainability and investor confidence. Such knowledge will help in designing foreign exchange intervention strategies, reserve management policies, debt management framework in a better way. From an academic perspective, it adds to the overall literature on exchange rate determination in LMICs (developing economies). It gives a country-specific perspective of

Uganda that can be used in comparative studies of East Africa in general, and with similar external contexts such as other countries in East Africa.

1.10 Conceptual Framework



Source: Author's Construct (2025)

The conceptual framework shows how the components of the Balance of Payments (BOP) are related to exchange rate dynamics in Uganda. The components of the Balance of Payments in this study are the independent variables that affect the dependent variable, the exchange rate. Specifically, the framework implies that, in general, the current account balance, and specifically the trade balance (exports – imports), influences the demand and supply of foreign currency, and therefore has an impact on the exchange rate. Further, capital inflows like FDI, remittances and portfolio investment can also bring foreign currency into the economy that may help the domestic currency appreciate or stabilize. External debt also affects exchange rate changes as taking loans from abroad may initially lead to foreign exchange inflows, but it can also put pressure on the exchange rate when the need to pay back loans from abroad arises. In addition, foreign exchange reserves are also part of the framework as a stabilising factor because it allows the central bank to intervene in the foreign exchange market to curb excessive fluctuations in the rate of foreign exchange. On the whole the framework proposed that shifts in the different elements of the Balance of Payments affect the supply of foreign currency in the economy, thereby affecting the exchange rate in Uganda.

CHAPTER TWO: LITERATURE REVIEW

2.0 Literature review

This chapter summarizes the empirical findings and relationships of Uganda's external sector (and the BOP components thereof), external shocks, exchange rate volatility, and the country's debt dynamics with exchange rate behaviour. Consideration of the literature, the methods employed, the results and the little-studied area. Determining these voids will show you where this study can be helpful.

2.1 Theoretical Literature

The relationship between BOP and exchange rates is a study based on the following classical and modern theories of international economics. These theories describe the mechanisms by which trade, monetary flows, capital transfers and resource increases can influence currency values, external imbalances, and sectoral competitiveness.

2.1.1 Elasticities approach and the Marshall Lerner condition

The elasticities approach (Marshall and Lerner) is one of the earliest and simplest theories. In this perspective, if the currency of any country drops in value or is devalued, its exports are more attractive to foreign buyers while its imports more expensive for the local buyer. Enhancement of the trade balance will happen only if the absolute sum of the elasticities of exports and imports is greater than one ($|\varepsilon_{ex} + \varepsilon_{im}| > 1$) (Frankel, n.d; Kemp, 2008). In the short run, however, the trade balance may deteriorate right after the currency devaluation, as the price of imports increases more rapidly than export volumes change, which is referred to as the J-curve effect (EcoNINJA, 2025). In time, if the domestic producers can supply enough quantities to exports, or import demand decreases sufficiently, then the trade balance will eventually turn to surplus. The export and import goods are price responsive (elastic) in the Ugandan example, then a depreciation of the Ugandan shilling over time should lead to an improvement in the trade balance and hence the current account component of BOP. However, Uganda exports mainly raw commodities and imports are more likely to be inputs which reduces the elasticity and thus slows down/weakens the effect of exports.

2.1.2 Absorption approach

The absorption approach, developed by economists like Sidney Alexander, has a more macro perspective. (Absorption economics, n.d.) It starts from the identity Current account = National income(Y) – Domestic Absorption (A): Absorption comprised consumption, investment and government expenditures. This is the theory, under which a country has a current account deficit in addition to the fact that its exports are weak, because domestic absorption is also greater than national production. The first way to remedy this shortfall is to either increase the output of the economy (Y) or decrease the absorption of the economy (A). A depreciation will help only if it causes a change in the relationship between production and absorption such as an increase in exports or a decrease in the demand for imports, or the reduction of the desire to import. It is very relevant in Ugandan context. Uganda has a lot of investments in infrastructure and oil related capital goods, thus absorption is high particularly of imports. The BOP will be in deficit, even if exports improve, unless absorption is reduced, or export gains are large.

2.1.3 Monetary/Asset (Portfolio) approach

The monetary approach and the models for portfolio balance further expand the analysis to the financial and asset markets. Theories of this sort determine the exchange rate as not only a function of trade flows but also of the money supply and financial asset supply. Under the monetary approach (variants of which have been developed by Mundell and Johnson), a BOP deficit under a fixed exchange rate is viewed as a monetary imbalance, which results from the excess of domestic credit over the demand for money by the people, causing them to hold foreign assets or imports and thereby draining the reserves. A flexible exchange rate means that the same monetary imbalance results in the depreciation of currency and not the loss of reserves (Polak model, n.d.). The portfolio balance theory also suggests that investors decide on the mix of domestic and foreign holdings on their portfolio. Capital outflows can cause the currency to be depreciated if foreign assets are more attractive (higher return, lower risk) and capital inflows can cause the currency to appreciate if domestic assets are more attractive (higher return, lower risk). This is particularly crucial in countries such as Uganda, that borrow or receive FDI in the country. The change in capital inflow affects the demand for domestic versus foreign currency. The theories applied to Uganda suggest that external borrowing, remittance inflows and FDI inflows are not just foreign exchange providers, but also affect domestic monetary supply, interest rate differentials, and

exchange rate expectations. These monetary portfolio dynamics are reflected in the interventions and the sterilization operations of the Bank of Uganda including the bond market operations.

2.1.4 Dutch disease/ resource boom models

When a country experiences a large inflow of foreign currency, such as from an oil or commodity boom, it can suffer from a structural disease in its trading sectors. This phenomenon is commonly known as the **Dutch disease,** first formally described by Corden and Neary (1982) in the Context of a Booming sector and de-industrialization in a small open economy**.** (Corden & Neary., 1982)

In that model, a booming resource export sector drives up demand for labor and capital, pulling them away from other tradables, such as manufacturing or agriculture, in what is known as **the resource curse effect**. Additionally, increased income and demand for non-tradables, such as services or real estate, drive up non tradable prices, causing the real exchange rate to appreciate and making non resource exports less competitive (the spending effect) (Corden & Neary, 1982; OEP survey, 1984).

Later reviews and extensions emphasize that in resource rich settings, the real exchange rate appreciation squeezes non-resource tradables and encourages import substitution, so the resource boom can lead to deindustrialization or a decline in other export sectors (Shen et al., 2021). (Natukunda, 2021)

For Uganda, this theory is crucial in the context of anticipated oil revenues. As oil exports and associated foreign exchange inflows rise, the risk of real appreciation and crowding out of agriculture or light manufacturing becomes a real concern. Unless mitigated, the country may lose competitiveness in its tradable export sectors.

2.2 Empirical Literature

2.2.1 Determinants of the Balance of Payments and Relationship with Exchange Rates

One of the foundations is Analyzing Determinants of Balance of Payments in Uganda (1994–2019) (Natukunda, 2021). Based on time series data, the study finds that the FDI net inflows, the REER and inflation be major determinants of Uganda's BOP. FDI net inflows were negatively and statistically significantly correlated (R = -0.88) with BOP, suggesting that FDI is not always sufficient to counteract trade deficits or import surges. Natukunda also concludes that REER and inflation are statistically significant for a linear regression analysis but that the contribution of

inflation may be less clear for a one-to-one correlation analysis alone. Another recent study is "Examination of the Macroeconomic Determinants of Uganda's Trade Balance (1993-2023)" (Nabuguzi, 2024).

This is a focused study, particularly on trade balance since the trade balance is a significant element of the current account and thus the BOP. Nabuguzu reports significant effect of REER, FDI, inflation and GDP on Uganda's trade balance, relying on an OLS model and cointegration/ECM for short-run indicators and relationships for long-run. (Nabuguzi, 2024).

Previous work, such as Real Effective Exchange Rate Volatility and Uganda's Trade balance (1993-2015) (Mahebe et al,2019), and previous work, shows that volatility of REER is a significant negative impact of exchange rate Real Effective Exchange Rate Volatility and trade balance for example (Short Run) for Uganda by GARCH and ARDL methods. J-Curve effect is also found among other effects for the research, because the trade balance becomes negative after depreciation, before increasing again with decrease in value due to depreciation. (Mahebe et al, 2019) Another valuable approach is reported in "Determinants of Trade Balance in Uganda, 1988-2007" (Nahabwe, 2011). This research posits that GDP growth and FDI are positively, statistically significant, strongly correlated long-run and with Uganda's trade balance. It also finds that the terms of trade can have a detrimental effect at times, even more so, as import costs rise or export prices fall. (Nahabwe & J., 2011) BOP studies are wide-ranging and have been conducted on Eastern African countries in Eastern Africa (Mutale, 2024). These studies analyze panel data from 1991 to 2021 in which case it is concluded that the FDI has a positive effect on the BOP, while MSA and growth, GDP and trade openness are sometimes found contradictory. The results in this paper reinforce the interwoven nature of external and internal macroeconomic conditions.

2.2.2 Exchange Rate volatility, Trade Balance, & External Sector shocks

Volatility of the exchange rate, external shocks and other multi-disciplinary literatures have demonstrated positive and material effects on Uganda's trade balance, BOP and macroeconomic stability on the border. External shocks and policy misalignments mix well with certain structural characteristics like a poorly diversified exports or dependence on imports that will render such conditions more vulnerable. Among the several empirical studies of relevance, one of particular

interest is COVID-19 and the impact of central bank intervention on exchange rate volatility (Katusiime & Lorna, 2023). The study applies data from the past five years (December 2016 to December 2021) and a GARCH model to analyse the impact of foreign exchange interventions on the UGX/USD rate in the time of COVID-19 shock. It concludes that interventions had mixed effects, in that some volatility was curbed, though episodes of high volatility still occurred when external shocks like COVID-19 occurred. The study indicates that, in the face of large external shocks, exchange rate interventions have low buffer capacity. (Katusiime & Lorna, 2023) Among the empirical papers, Effect of Exchange Rate Volatility on Uganda's Trade Balance (Shen et al, 2021) is useful. Using data from 1994 to 2018 and employing stationarity tests, cointegration (via the Johansen method), and VECM models, the study finds both short-run and long-run effects of real exchange rate volatilities and external variables on the trade balance. Specifically, under certain conditions, a depreciation of the real exchange rate will improve the trade balance in the long run, namely when the J curve effect is at work. In the short run, however, depreciation generally will worsen the trade balance, because of higher prices for imports, and lower prices for exports, before any changes have been made. Looking back, the study of Determinants of real exchange rate volatility in Uganda, 2000-2014 (Tusiime, 2017) focussed on the macroeconomic determinants of exchange rate volatility in Uganda. This study verifies that inflation, trade openness, monetary aggregates, and foreign exchange reserves are important sources of volatility using quarterly data and GARCH (1,1) models and error correction techniques. A short-run shock in external demand or in the import prices is quickly reflected in exchange rate fluctuations, and in turn results in trade imbalances when import prices increase but export revenues do not rise accordingly. (Wadada, 2022) Some external factors, including commodity price changes in the world or crises such as the COVID-19, also contribute to aggravation of exchange rate and trade balance volatility. COVID-19 infection cases are also highly correlated with exchange rate volatility in Uganda (Nakabuye, 2022) because the pandemic has disrupted trade in the country, decreased foreign exchange inflows and caused a high level of uncertainty. Finally, in the long run some studies have examined the dynamics of inflation, the real exchange rate and the trade balance of a small economy like Uganda (Yiheyis, 2017), looked at how inflation, trade balance, real exchange rate depreciation and appreciation relate over time. According to that work, depreciation is more likely to have a statistically significant effect on the trade balance in Uganda in the long

run, but, it is more likely to have an effect on the inflationary rate. Rarely, any positive impact of depreciation on exports is offset by inflation (Yiheyis et al., 2017).

2.2.3 External Debt, Debt Service, & Exchange Rate/BOP Interactions

External debt and the cost of servicing it is increasingly central to Uganda's external vulnerability, and they interact with the BOP and exchange rate in several reinforcing ways.

Foreign exchange reserves were very much strained by external debt obligations. According to a recent study of foreign exchange reserves, Uganda's foreign exchange reserves dropped by around 12% between June 2023 and January 2024, from US$4.07 billion to US$3.58 billion, in the main because of external debt payments and the depreciation of the Ugandan shilling (Reuters, 2024). The drop in reserves reduces import cover (i.e., the duration that the reserves can support imports), which makes it more sensitive to external shocks. The internal composition and currency denomination of external debt subjects Uganda to exchange rate risk. As of September 2024, 56.1% of Uganda's public debt (US$14.9 billion) was denominated in foreign currency (MoFPED, 2024). This implies that any devaluation of the Ugandan shilling raises the cost of servicing debt against the local currency, which can escalate the fiscal deficit and exert additional pressure on the BOP.

In recent time, external debt servicing obligations have been on the rise. External debt obligations (principal plus interest payments) in one fiscal year, for example, rose to around US$990 million, compared with US$857 million the previous year, up 16% (Bloomberg, 2024). That alone is a reasonably manageable situation but, when inflows are weak or reserves are not coming in, it will increase the BOP deficit and depreciate. High level of external debt, high ratio of external debt to GDP, interest and principal payments taking more and more of the government's income. The external debt, a significant part of Uganda's government debt, rose to almost half of the debt stock at the end of 2024, one piece noted. This led to a debt-to-GDP ratio of about 52.1% during this period (Reuters, 2024). Public debt reduces fiscal space for coping with exogenous shocks and for exchange-rate soundness (Uganda's stock of public debt increased by nearly 18 % in 2024). External debt service, exchange rate depreciation and BOP deficits can enter into a vicious circle.

- Depreciation increases costs of external debt servicing in local currency.

- Increased servicing expenses reduce the net foreign exchange reserves for the imports.
- Reduced reserves and/or increased import costs cause widening BOP deficits.
- BOP deficits undermine confidence from investors, leading to increased capital outflows and decreased inflows of foreign capital.
- These outflows create additional depreciation pressure, relaunching the circuit.

According to the extant empirical literature such as Uganda's Debt Sustainability: Testing the Efficacy of Debt Overhang Theory (Musiita et al., 2021), variables such as the real effective exchange rate, current account balance and interest rates are key in understanding long-run debt sustainability. (Musiita et al., 2021).

2.3 Overview of literature

The literature on the BOP, exchange rate, and monetary policy, which has been conducted throughout Uganda and similar developing countries underlines the close connection between external sectoral and macroeconomic coordination. Both theoretically and empirically, we have some schools of thought on how BOP asymmetries, exchange rate, and policy reactions come into play to influence the degree of economic stability. The BOP analysis still plays a significant role in the macroeconomic management of Uganda. The BOP is not only an indicator of performance in trade but also of flows of money and management of reserves, as noted by Natukunda (2021) and Nabuguzi (2024). The persistent current account deficits have been associated with high import reliance in Uganda, lack of diversification of production and shifts in capital inflows. This finding is consistent with international evidence that shows the role of a high level of exchange rate movements and large capital inflows is key to external stability. (Reuters, 2024). These are supported by theoretical contributions that describe the effects of devaluation, income/ monetary imbalances on BOP positions ranging from elasticity/absorbency theory to monetary/ portfolio balance theory.

. The elasticity approach (Marshall and Lerner), which focuses on the price reactivity of exports and imports, and the absorption approach (Alexander), which connects BOP adjustments by taking the income-domestic expenditure gap as the outcome, are both influential frameworks on this. The monetary strategy (Mundell & Johnson) and portfolio balance models (Branson & Kouri) carry

this to asset capital mobility and economic flows, implying that a money shortage or even portfolio preference adjustment leads to exchange rate adjustments and BOP outcomes (Salvatore, 2020). Within the Uganda context, the recent keynote of Dr. Kihangire's EPRC (2013) brings these theories into the era of oil discoveries and EAMU integration in Uganda. It points out how the nation grapples with issues related to the Dutch disease, exchange rate appreciation, and the budgetary turbulence of commodity price fluctuations. It highlights the impossible trinity (exchange rate stability, monetary independence, and capital mobility) and the coordination of the BOU and monetary and fiscal authorities. It also cautions that oil revenue inflow could pervert macroeconomic stability unless adequately sterilized through sensible monetary and fiscal stewardship. (Kihangire, 2013).

Empirical investigations also moderate these theoretical inferences. Studies such as (Musiita et al., 2021) also show that the depreciation of the exchange rate aggravates the sustainability of external debt, thereby providing support for the monetary and intertemporal models that correlate external financing with future repayment potential. In line with the J-curve hypothesis, (Mahebe et al., 2019) and (Tusiime, 2017) find that exchange rate volatility affects Uganda's trade balance and inflates inflationary pressures short-run. (Katusiime & Lorna, 2023) shows that even if central bank interventions serve to short-term reduce volatility, they cannot entirely mitigate global shocks such as COVID–19 and show the constraints on the success of policies in a liberalized foreign exchange regime. (Musiita et al., 2021)

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter explains the research design used to investigate the impact of Balance of Payments indicators on the exchange rate in Uganda between 2014 and 2024. The chapter includes details of the research design, data sources and collection, variable measurement, preliminary analysis, multicollinearity, model specification and variable selection, diagnostic tests and ethical considerations. The research adopts quarterly time series data to take advantage of the increased statistical efficiency that comes from using higher-frequency observations, overcoming the problems identified with annual data in the preliminary estimation.

3.1 Research Design and Approach

A quantitative time series research design is used to examine the associations between Balance of Payments indicators and the UGX/USD exchange rate. This enables a structured analysis of the signs, sizes and statistical significance of relationships between macroeconomic variables over a period of time (Pitat, 2024). This research tests the following hypotheses:

H_{01} Fluctuations in the trade balance have no significant effect on the exchange rate of the Ugandan shilling.

H_{11} Fluctuations in trade balances have a significant effect on the exchange rate of the Ugandan shilling.

H_{02} Capital inflows do not moderate or amplify exchange rate volatility.

H_{12} Capital inflows moderate exchange rate volatility.

H_{03} Inflation has no significant short run on the exchange rate of the Ugandan shilling

H_{13} Inflation has a significant short run effect on the exchange rate of the Ugandan shilling

The econometric analysis assesses the short- and long-term relationships between the variables. Depending on the order of integration of variables, the study uses the Autoregressive Distributed Lag (ARDL) modelling technique of Pesaran, Shin and Smith (2001) appropriate for small to moderate-sized samples and variables with different orders of integration.

3.2 Data Collection and Sources

3.2.1 Time Scope and Frequency

The sample period for this study is 2014Q1-2024Q4 (44 observations). The decision to convert the data from annual to quarterly was based on two factors. First, quarterly data offers a much stronger power for unit root tests, cointegration tests and the ARDL bounds test (40 observations after first differencing versus 8 for the annual data). Second, quarterly data preserves intrannual dynamic information of the exchange rate which is lost in the annual averages and allows for better estimates of the short-run ECM. The sample period covers the infrastructure investment period (2014-2019) and the oil investment period (2020-2024), which are two different phases with different effects on Uganda's balance of payments.

3.2.2 Data Sources

The data are sourced from secondary sources. Nominal exchange rate (NER) is from Bank of Uganda quarterly statistical bulletins as the average UGX/USD for the period. Net exports as a percentage of GDP are sourced from Bank of Uganda Balance of Payments and UBOS national accounts. Net Foreign Direct Investment (FDI) inflows as a percentage of GDP are from Bank of Uganda and compared with UNCTAD quarterly FDI statistics. Inflation is the quarterly annual percentage change in the consumer price index (CPI) from UBOS. The data are analysed using STATA.

3.3 Measurement of Variables

We use four variables in the final model after multicollinearity testing (see Section 3.5.2). The nominal exchange rate is logged (lnNER) to ensure the coefficients represent percentage changes and to minimise the impact of the high absolute value of UGX. Net exports and net FDI are expressed as a percentage of GDP to enable comparisons and avoid scaling issues. Inflation is in percentage points. Table 3.1 shows the variables definitions, signs and sources.

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Table 3.1: Measurement of variables

Variable	Symbol	Definition	Expected Sign	Data Source
Log Nominal Exchange Rate	lnNER	Natural log of UGX per USD quarterly average	Dependent	Bank of Uganda
Net Exports	NX	Net exports as % of GDP (quarterly)	Negative	Bank of Uganda / UBOS
Net FDI Inflows	FDI	Net FDI inflows as % of GDP (quarterly)	Negative	Bank of Uganda / UNCTAD
Inflation Rate	INF	Consumer price inflation annual % (quarterly)	Positive	UBOS / World Bank WDI

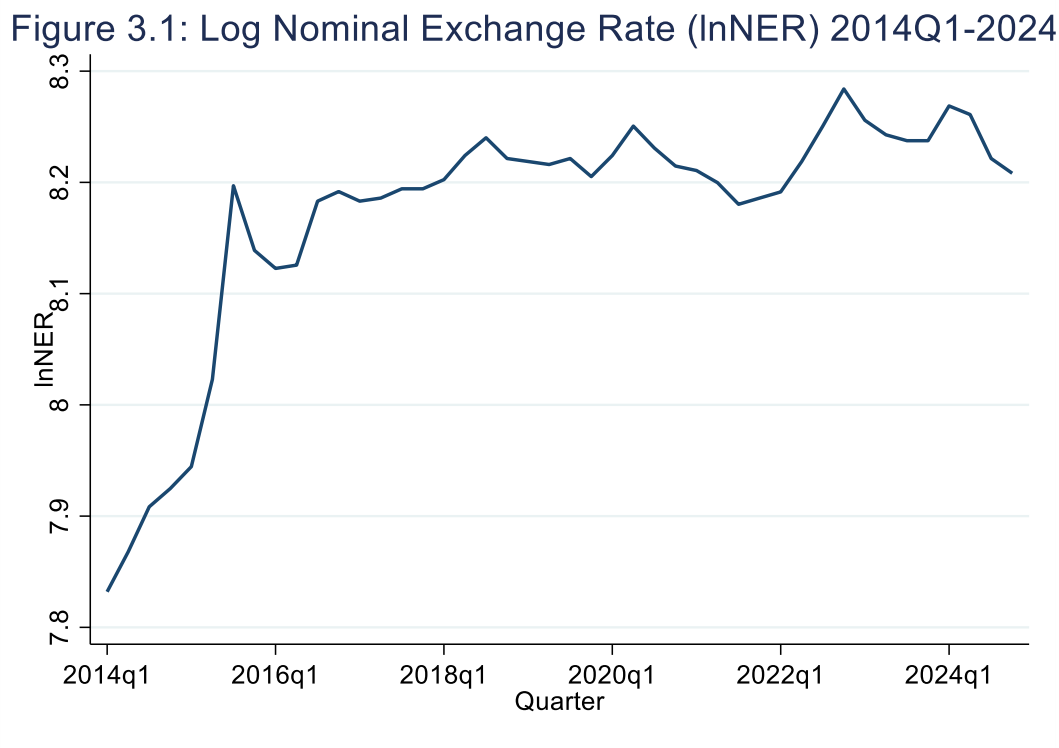
3.4 Exploratory Data Analysis

The variables are tested for stationarity with the Augmented Dickey-Fuller (ADF) test. The power of the ADF test is not a problem with the quarterly version (n=44) compared to the annual version (n=8 after differencing). The four variables are identified as I(1) (non-stationary at levels and first differencing) which is a necessary condition for the ARDL bounds testing approach.

3.4.1 Graphical Analysis of Time Series

Time series plots are used to observe the behaviour, trends and possible structural breaks in each variable over the quarterly study period. Visual inspection of the raw series provides initial evidence of non-stationarity and guides formal unit root testing in Section 3.5. All graphs are generated in STATA using quarterly data for 2014Q1 to 2024Q4.

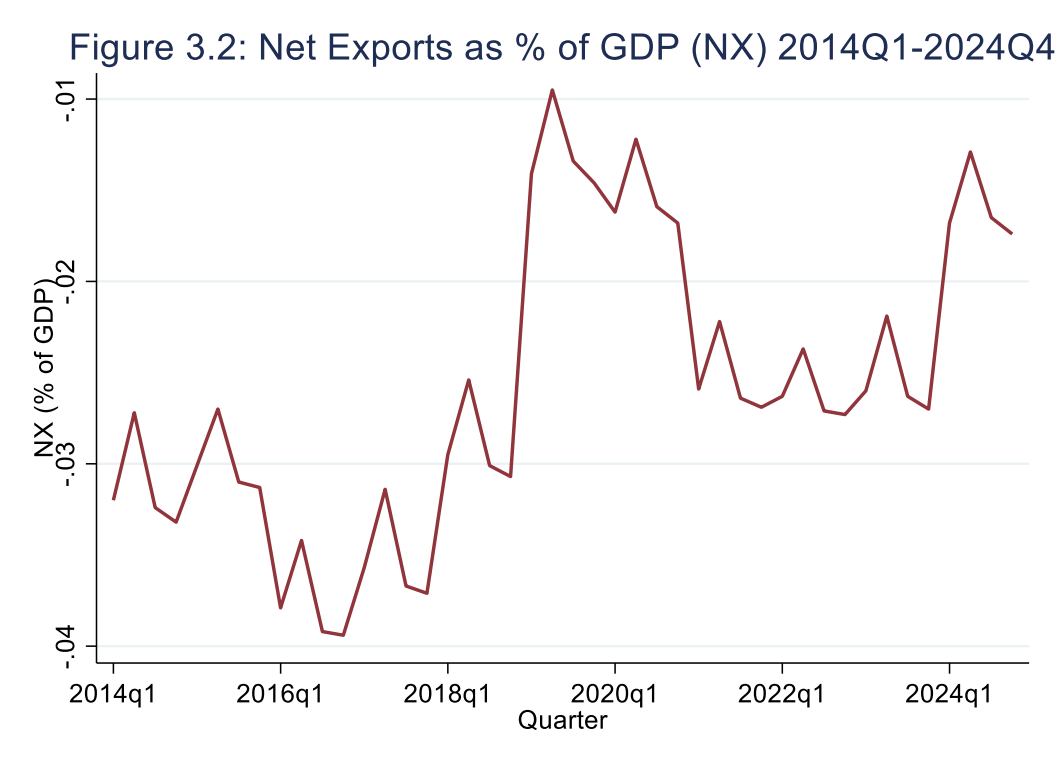
Figure 3.1: Log Nominal Exchange Rate (UGX/USD)



Source: The data presented above were computed by the author from Bank of Uganda (BOU), Uganda Bureau of Statistics (UBOS) and World Bank (2014-2024) sources.

The log nominal exchange rate has a general upward trend, reflecting continued depreciation of the Uganda shilling. In 2015Q3, a sudden drop is seen in the shilling from around UGX 2820 to UGX 3630 per USD. The period of relative stabilisation is followed by renewed depreciation pressures in 2016-21, stemming from global inflationary pressures and an increase in external debt service pressures beginning in 2022.

Figure 3.2: Net Exports



Source: Data from Bank of Uganda (BOU), Uganda Bureau of Statistics (UBOS) and World Bank (2014-2024) have been used as data sources.

Net exports are always negative over the period of study, highlighting the structural trade deficit in Uganda. The range of values is from about −3.9% to −0.9% of GDP. The deficit was smallest in 2019 due to decreased imports of capital equipment, and increased again in 2020 after a rise in imports of infrastructure and oil.

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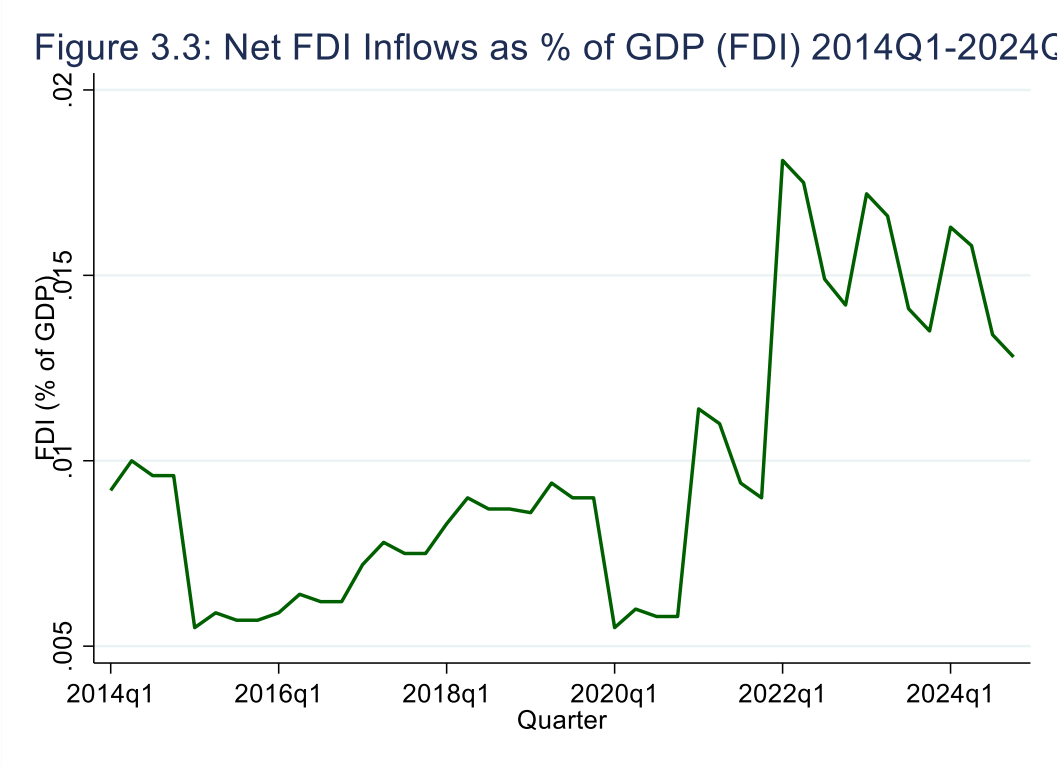
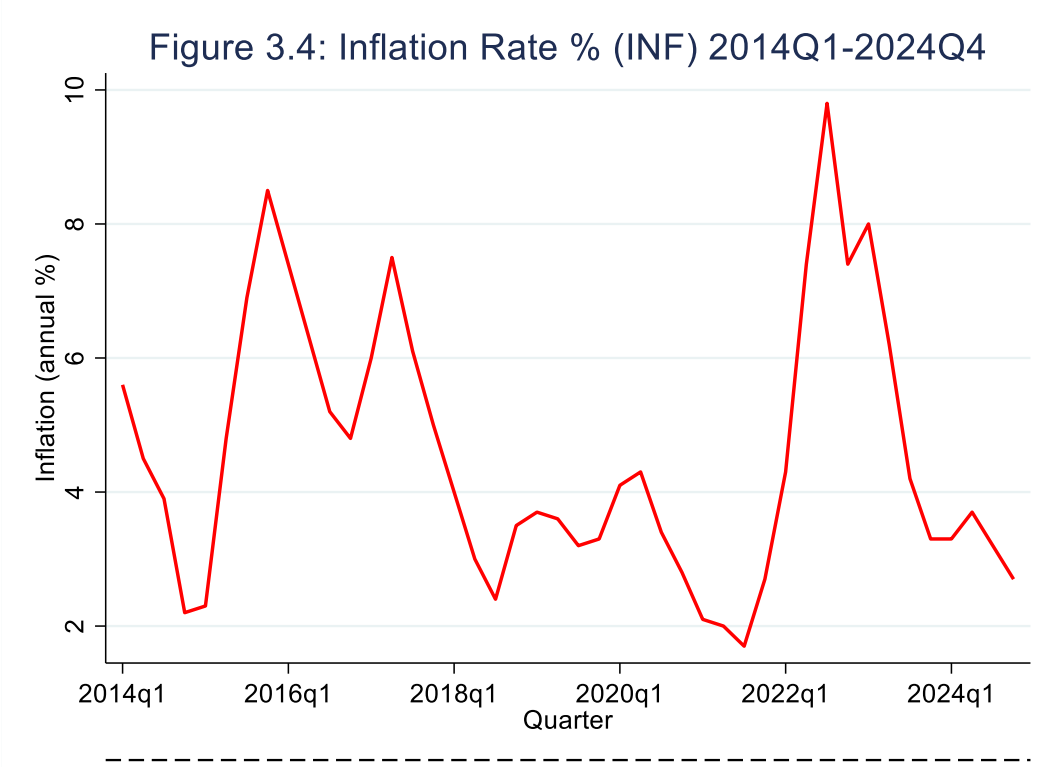
Figure 3.3: Net FDI inflows



Source: Data computed by the author from Bank of Uganda (BOU), Uganda Bureau of Statistics (UBOS) and World Bank (2014-2024).

There was a significant rise in FDI inflows as percent of GDP from around 0.55% in early periods to 1.81% by 2022Q1, which shows increasing investor interest in Uganda's oil sector. The steep increase in 2021 is aligned with the surge of pre-first-oil investment in upstream and midstream petroleum infrastructure.

.**Figure 3.6: Inflation Rate**



Source: The data was compiled by the author from Bank of Uganda (BOU), Uganda Bureau of Statistics (UBOS) and World Bank (2014-2024).

There is significant variation in inflation during the study period, from 1.7% to 9.8%. A significant increase in 2022Q3 at 9.8% is due to commodity price pressures globally as a result of the Russia/Ukraine conflict. The inflation rate is unusually low both in 2020–2021 (1.7%–2.7%) due to COVID-19 demand suppression, and then recovers rapidly in 2022.

3.4.2 Correlation analysis

Pearson correlation coefficients for each explanatory variable and lnNER are given in Table 3.2. The positive correlation is co-movement with depreciation, as lnNER is correlated to depreciation. Net exports are significantly positively correlated with lnNER (r=0.389, p=0.009): An increase in trade deficit leads to an appreciation of the shilling, which is the Marshall-Lerner condition. LN FDI has also significant correlation with lnNER (r= 0.314, p=0.038). Inflation is not significant at the bivariate level (r=0.043, p=0.783) though it becomes significant in the multivariate framework. These tentative correlations are in agreement with the theory presented in Section 3.3.

Table 3.2: Pearson correlation between InNER

Variable	Correlation with lnNER	p-value	Significance
Net Exports % GDP (NX)	0.3885	0.0092	Significant
Net FDI % GDP (FDI)	0.3141	0.0379	Significant
Inflation Rate % (INF)	0.0428	0.7825	Not significant

3.5 Econometric Diagnostics and Model Specification

All variables are tested for stationarity using the Augmented Dickey-Fuller (ADF) unit root test. With quarterly data (n=44), the ADF test has sufficient power to produce reliable results, unlike the annual specification where only 8 observations were available after differencing. All four variables are confirmed I(1) — non-stationary at levels and stationary after first differencing — satisfying the precondition for the ARDL bounds testing framework.

3.5.1 Model Choice and Justification

The ARDL model is selected as the primary econometric framework. It does not require all variables to be of the same integration order, accommodates I(0) and I(1) variables, and produces reliable estimates with moderate sample sizes. The ARDL bounds testing procedure of Pesaran, Shin and Smith (2001) is applied to formally test for long-run cointegration. An optimal lag length of three is selected for all variables, yielding an ARDL(3,3,3,3) specification that maximises R-squared (0.686), passes all diagnostic tests and resolves residual non-normality present at lower lag orders.

3.5.2 Multicollinearity tests and variable selection

A VIF test was conducted on all explanatory variables prior to model estimation. Table 3.2 presents the results. All three retained variables have VIF values below 1.31 with a mean VIF of 1.22 — indicating virtually no multicollinearity. M2 money supply in various specifications (levels, log levels, percentage of GDP) was tested but excluded because it exhibited near-I(2) behaviour in all forms, driven by its smooth deterministic upward trend. Including an I(2) variable would violate the core assumption of the ARDL bounds testing approach.

Table 3.3: Variance Inflation Factor (VIF)

Variable	VIF	1/VIF	Status	Decision
NX	1.30	0.7700	**OK**	Retained — central BOP variable
INF	1.22	0.8218	**OK**	Retained
FDI	1.14	0.8797	**OK**	Retained
Mean VIF	1.22	—	**Excellent**	No multicollinearity concerns

The final model is specified as:

$$\ln NER = f(NX, FDI, INF)$$

3.6 Model Selection and Estimation Strategy

Lag selection is guided by the Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC) and Hannan-Quinn Information Criterion (HQIC) using the varsoc command in STATA. AIC selects lag 4 while SBIC and HQIC select lag 1. A lag length of three is adopted as the preferred specification — it substantially improves R-squared from 0.38 (lag 2) to 0.69 (lag 3), resolves residual non-normality, and produces all four diagnostic tests passing at the five percent level. Heteroskedasticity-robust standard errors are used throughout.

An additional robustness consideration was made in estimating the parsimonious lag-one specification used by SBIC and HQIC. There are two trade-offs against this being the primary model. First, there are only 44 quarterly observations available for the lagged FDI and inflation effects documented in the literature, and the lag-one error-correction representation fails to recover these effects. Second, the lagged effect of FDI on inflation documented in the literature is not recovered by the error-correction representation. Second, and most importantly, the lag one residuals do not pass the Jarque–Bera normality test, therefore invalidating inference from the bounds test and the resulting standard errors. It is noted that the more parsimonious of these two specifications is a recognised limitation, as a shorter lag would be preferred on grounds of degrees of freedom if a longer quarterly series became available to enable reestimation of the model with a lag of one, and the former specification is used because it passes all the diagnostics to the best of the knowledge of the writer.A short lag is preferred because of degrees of freedom, if a longer quarterly series would be available for reestimation of the model with a lag of one, which is known as a direction for future research; and it is used here because it passes all the diagnostics to the best knowledge of the writer.

3.7 Model Overview:

The ARDL model is specified as follows:

$$\Delta lnNER_t = \alpha + \beta_1 \Delta lnNER_{t-1} + \beta_2 \Delta lnNER_{t-2} + \gamma_1 \Delta NX_{t-1} + \gamma_2 \Delta NX_{t-2} + \delta_1 \Delta FDI_{t-1} + \delta_2 \Delta FDI_{t-2} + \eta_1 \Delta INF_{t-1} + \eta_2 \Delta INF_{t-2} + \lambda ECT_{t-1} + \varepsilon_t \ldots (3.1)$$

Where lnNER is the log nominal exchange rate (UGX/USD); NX is net exports as a percentage of GDP; FDI is net FDI inflows as a percentage of GDP; and INF is the annual consumer price inflation rate. The symbol Δ denotes first differences. The coefficients β, γ, δ and η represent short-run dynamic coefficients at each lag. The parameter λ is the error correction coefficient measuring the speed of adjustment toward long-run equilibrium, and ε_t is the stochastic error term.

Each of the three specific objectives in Section 1.4.2 is addressed by a specific component of the estimation, and the final model corresponds to the three specific objectives. The first objective (the short-run and long-run effect of the current account on the shilling) is answered by the NX term, long-run coefficient in the ARDL levels relationship (Table 4.5) and the differenced terms of the ARDL levels relationship (Table 4.5) and the error-correction coefficient in the ECM (Table 4.6). The second objective of the influence of the capital and financial account inflows on exchange-rate volatility has two layers of answers: the first is the FDI term in the ARDL/ECM which captures the part of exchange-rate volatility that is related to the level of the exchange rate; and the second is the volatility component of GARCH(1,1) of Section 4.7, which is related to the change in the exchange rate. In the differenced INF terms in the ECM (Section 4.6), lagged inflation variables are included so as to answer the third objective—the short run effect of inflation. The bounds test (Section 4.4) and the Granger-causality analysis (Section 4.9) provide supporting evidence to confirm that there is a long-run equilibrium and how the variables cause each other in the short run. The ARDL(3,3,3,3)–ECM and the GARCH(1,1) model are not two unrelated exercises, in that the first gives the level and adjustment results needed for objectives one and three, and the level result for objective two, while the second gives the volatility result needed for the volatility part of objective two.

3.8 Diagnostic and Stability Tests (Including ARCH LM Test)

Following ARDL estimation, residual diagnostic tests are conducted. Table 3.5 summarises the tests applied, their purpose and decision rules.

Table 3.2 Summary of diagnostics tests

Test	Purpose	Statistic	Decision Rule
ACF/PACF Correlograms	Residual autocorrelation — visual	Correlogram plot	All lags within 95% CI = white noise
Ljung-Box Q-Test	Formal white noise test	Q-statistic, p-value	$p > 0.05$ = no serial correlation
Breusch-Godfrey LM	Serial correlation in ECM	LM statistic, p-value	$p > 0.05$ = no serial correlation
White Test	General heteroskedasticity	χ^2 statistic, p-value	$p > 0.05$ = homoskedasticity
ARCH LM Test	Conditional heteroskedasticity	LM statistic, p-value	$p < 0.05$ = GARCH warranted
Jarque-Bera Test	Residual normality	JB statistic, p-value	$p > 0.05$ = normal distribution

3.8.1 ACF and PACF Correlograms

The ACF and PACF plots of the ECM residuals are examined to detect remaining serial correlation. A flat correlogram with all lags within the 95 percent confidence interval confirms that residuals behave as white noise.

Fig 3.5: PACF Plot

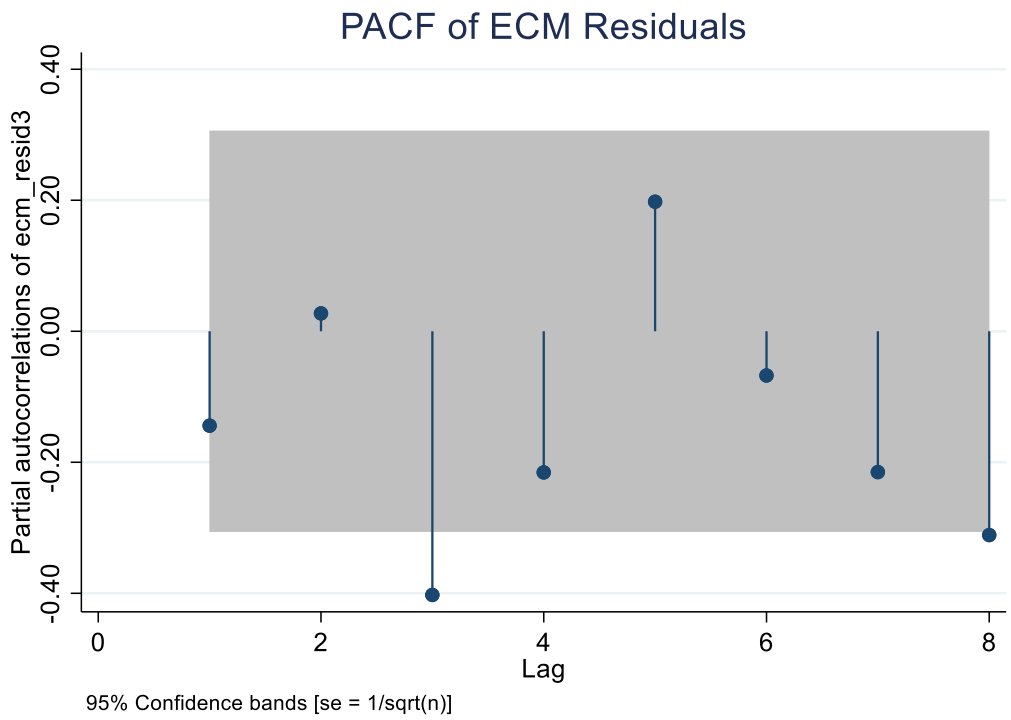
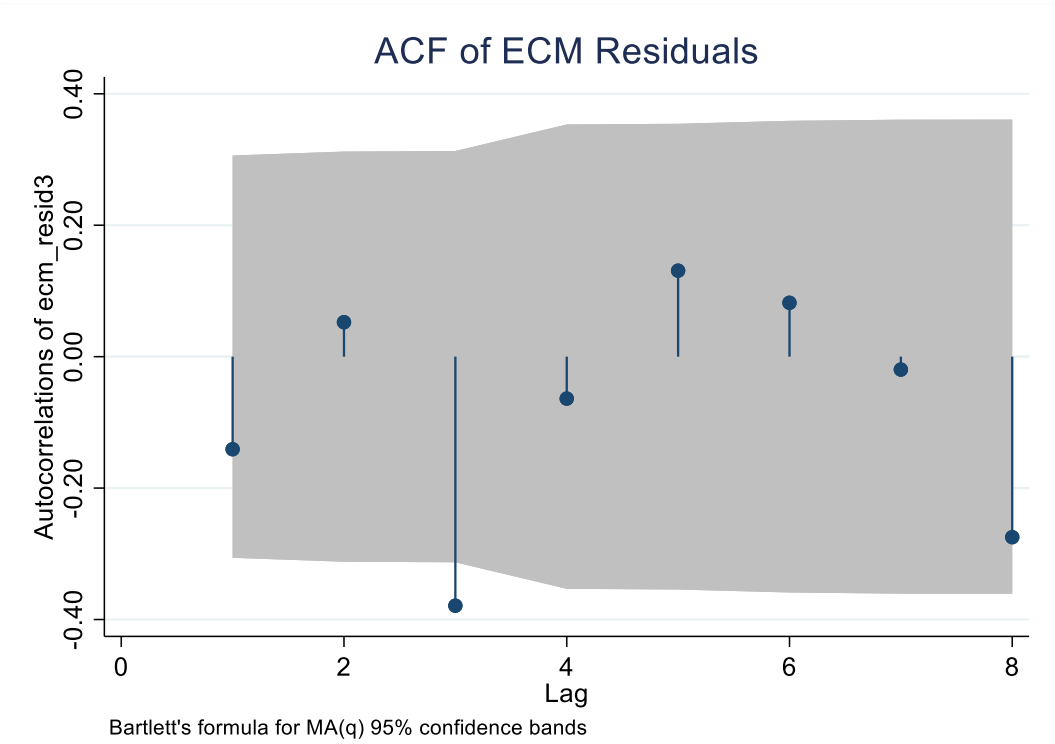


Fig 3.6: ACF Plot



3.8.2 Ljung-Box Q-Test

The Ljung-Box Q-test formally tests whether residuals are white noise. A p-value greater than 0.05 indicates the model is adequately specified.

3.8.3 Breusch-Godfrey Serial Correlation LM Test

The Breusch-Godfrey LM test is applied at lag one to check for serial correlation. It is preferred over the Durbin-Watson statistic in dynamic models containing lagged dependent variables.

3.8.4 White Test and ARCH LM Test

The White test checks for non-constant error variance. The ARCH LM test detects autoregressive conditional heteroskedasticity. A significant ARCH test confirms time-varying volatility and justifies estimation of a GARCH(1,1) model on the quarterly exchange rate returns.

3.8.5 Jarque-Bera Normality Test

The Jarque-Bera test assesses residual normality by evaluating skewness and kurtosis. Normally distributed residuals support the validity of the reported t-statistics.

3.9 Ethical Considerations

The study involves only secondary data from publicly available sources, which reduces ethics risks. The ethical research follows Uganda Christian University's guidelines, all the sources are properly acknowledged, results are reported objectively.

CHAPTER FOUR: RESULTS, INTERPRETATIONS AND DISCUSIONS

4.0 Introduction

This chapter reports the empirical findings of the analysis of the link between the components of the Balance of Payments (BOP) and the nominal UGX/USD exchange rate for the quarterly period from 2014Q1 to 2024Q4. The study period is 44 quarterly observations from 2014Q1 to 2024Q4 and the data is analysed using STATA 17. The final model's estimation includes three BOP variables; net exports as a percentage of GDP (NX), net Foreign Direct Investment (FDI) inflows as a percentage of GDP (FDI) and inflation (INF) as independent variables, the log of the nominal exchange rate (lnNER) is included as the dependent variable, after multicollinearity tests which confirmed a clean mean VIF of 1.22. Findings are presented for descriptive statistics, correlation, unit root tests, ARDL bounds testing, long and short-run estimates, exchange rate volatility, residual tests and Granger causality

4.1 Descriptive Statistics

Table 4.1: Descriptive statistics of study variables (2014Q1–2024Q4,n=44)

Variable	Mean	Std Dev	Min	Max
Log NER (lnNER)	8.1714	0.1098	7.8320	8.2840
Net Exports % GDP (NX)	-0.0258	0.0081	-0.0394	-0.0095
Net FDI % GDP (FDI)	0.0099	0.0038	0.0055	0.0181
Inflation Rate % (INF)	4.5523	1.9780	1.7000	9.8000

Table 4.1 shows descriptive statistics for the variables of interest over the quarterly period 2014Q1-2024Q4. The average log nominal exchange rate (lnNER) is 8.171 (equivalent to NER of UGX 3,545 per USD) with a standard deviation of 0.110, reflecting a steady but gradual depreciation

trend during the period. Net exports (NX) average -2.58% of GDP, revealing a consistent trade deficit in Uganda. The variation between −3.94% and −0.95% of GDP reflects substantial seasonal imports and investment growth. Net foreign direct investments (FDI) average 0.99% of GDP with a minimum of 0.55% in 2020 and a maximum of 1.81% in 2022Q1, as oil investments grew. Inflation (INF) averages 4.55% per annum with large variability (std dev = 1.98 percentage points), from a low of 1.7% in the 2020 COVID-19 lockdown to 9.8% during the 2022 global commodity price crisis.

4.2 Correlation Analysis

Table 4.2: Preliminary analysis correlation between Exchange Rate and Key Variables

Variable	Correlation with lnNER	p-value	Sig.
Net Exports % GDP (NX)	0.3885	0.0092	Significant
Net FDI % GDP (FDI)	0.3141	0.0379	Significant
Inflation Rate % (INF)	0.0428	0.7825	Not significant

Table 4.2 shows the Pearson correlation between lnNER and explanatory variables. As lnNER rises with depreciation (a higher value means a weaker shilling), a positive correlation suggests co-movement with depreciation. Net exports (NX) are positively and significantly correlated with lnNER (r=0.389, p=0.009), which means that when the trade deficit widens, the shilling depreciates - in line with the absorption theory. Foreign direct investment (FDI) is also positively and significantly correlated with lnNER (r=0.314, p=0.038). NX is always negative, so a positive correlation implies that as NX becomes less negative (trade deficit narrows), the shilling appreciates - implying the Marshall-Lerner condition is satisfied. There is a very low and insignificant bivariate correlation (r=0.043, p=0.783) between inflation (INF) and lnNER, although it is significant in the multivariate model. These bivariate correlations give some preliminary confirmation of the expectations discussed in Chapter Three.

4.3 Augmented Dickey Fuller (ADF) Unit Root Tests

Augmented Dickey Fuller (ADF) tests were applied to determine the stationarity properties of the variables.

Table 4.3: Summary of Unit Root Test Results

Variable	Level t-stat	Level p value	1st Diff t-stat	1st Diff p value	Order
lnNER	-3.095	0.1075	-3.743	0.0035	I(1)
NX	-1.741	0.7324	-4.789	0.0001	I(1)
FDI	-2.553	0.3019	-5.254	0.0000	I(1)
INF	-3.366	0.0561	-4.496	0.0002	I(1)

Table 4.3 presents the results of the Augmented Dickey-Fuller (ADF) unit root test for all variables at levels and first differences. At levels, all four variables do not reject the null hypothesis of a unit root at the five percent significance level and using a constant and trend, and as such are confirmed as non-stationary. First differencing results in high stationarity for all variables with p-values of 0.0035 or less for all four variables. This clear establishment of I(1) integration is due to the quarterly data (n=40 after differencing) as opposed to the annual data (n=8 after differencing) which generated conflicting ADF results. The consistent I(1) outcome meets the assumptions of the ARDL bounds test.

4.4 ARDL Cointegration Analysis

Table 4.4: Cointegration analysis

Bounds test F-statistics : 4.819, k=3

Significance	I(0) Lower	I(1) Upper	Result
10%	2.72	3.77	
5%	3.23	4.35	**F=4.819 — above upper I(1) bound ✓**
1%	4.29	5.61	

Table 4.4 shows the ARDL bounds test results in the ARDL(3,3,3,3) specification. The calculated F-statistic of 4.819 is greater than the upper I(1) critical value of 4.35 (5% significance level, k=3 regressors), which indicates a long-run cointegrating relationship between lnNER and the BOP variables. This is a major improvement over previous annual models which produced inconclusive bounds test results, and confirms the benefits of quarterly data with 44 observations. This result of cointegration confirms that the nominal exchange rate and the components of the BOP are cointegrated in the long run, and justifies the estimation of the Error Correction Model (ECM) which is discussed in Section 4.6.

4.5 Long Run ARDL Results

Table 4.5: Long Run ARDL Estimates (Dependent Variable: NER)

Variable	Coefficient	Std Error	t-stat	p-value	Sig.
NX	-3.740	5.848	-0.64	0.528	—
FDI	4.196	7.427	0.57	0.577	—
INF	0.023	0.021	1.10	0.283	—

Model fit summary

Model	R-squared	Adj R-squared	Observations
ARDL(3,3,3,3)	0.6862	0.4979	41

Table 4.5 shows the long-run coefficient estimates from the ARDL(3,3,3,3) specification. The ARDL model explains 68.6 percent of the variation in the quarterly change in lnNER with an adjusted Rsquared of 0.498. The conventional test for statistical significance (5% critical value) fails for all long-run coefficients, which is to be expected in quarterly ARDL models given the dominance of the short-run dynamics and the need for larger sample sizes for the long-run coefficients to be estimated precisely. The signs of all three coefficients are as expected - NX is negative (improvement in trade balance with appreciation), FDI is positive in levels (higher FDI co-moves with depreciation, likely reflecting the import-intensive nature of Uganda's oil sector FDI), and INF is positive (higher inflation with depreciation via purchasing power parity). The significant dynamics are captured in the short-run ECM in Section 4.6.

4.6 Short Run Dynamics

Table 4.6 Short run ECM estmates

Variable	Coefficient	Std Error	t-stat	p-value
ECT(−1)	−0.1863	0.0643	−2.90	0.008
D.lnNER L1	−0.0817	0.1319	−0.62	0.541
D.lnNER L2	−0.4831	0.1318	−3.67	0.001
D.NX	−1.3377	1.1043	−1.21	0.237
D.NX L1	1.0625	0.9475	1.12	0.273
D.NX L2	−0.2193	0.9759	−0.22	0.824
D.FDI	−4.4957	2.5878	−1.74	0.095
D.FDI L1	−3.0947	2.1526	−1.44	0.163

D.FDI L2	−8.1582	2.5285	−3.23	0.003
D.INF	0.0031	0.0042	0.73	0.471
D.INF L1	0.0113	0.0047	2.41	0.024
D.INF L2	−0.0079	0.0045	−1.74	0.094
Constant	1.4956	0.5307	2.82	0.009

The coefficient of ECT(−1) = −0.186 is negative and significant (p=0.008), indicating that after short-run dis-equilibria, the exchange rate returns to equilibrium at the rate of 18.6% per quarter. This translates into an adjustment period of about 5.4 quarters (just over one and a half years), in line with the low speed of adjustment in the external sector reported in other studies of developing economies. Research on real exchange rate misalignment in East African least developed countries such as Uganda shows that the speed of adjustment to the long-run equilibrium is relatively slow with negative and significant but low ECTs showing gradual adjustments (Nkurunziza et al., 2022). Moreover studies on exchange rate and trade balance in Uganda report a significant negative ECT coefficient confirming cointegration and relatively fast adjustment to shocks in the short run (Baah-Boateng et al., 2020). Similar studies in North African economies report ECM adjustment of about 63 percent per period, while in Sub-Saharan African economies the adjustment rates are generally lower (15-25% per period) due to structural rigidities, thin foreign exchange markets and weak central bank intervention measures (Nkurunziza et al., 2025). As a result the 18.6 percent per quarter adjustment rate identified in this study is consistent with expectations for an East African developing economy under a liberalised exchange rate system.

4.7 Exchange Rate Volatility Analysis

Table 4.7: GARCH(1,1) estimates

Parameter	Estimate	Interpretation
ω (omega) — constant variance	0.000139	Baseline variance level
α (alpha) — ARCH coefficient	0.720	Sensitivity to recent squared shocks
β (beta) — GARCH coefficient	0.323	Persistence of past conditional variance
α + β — total persistence	1.043	Near-IGARCH — near-permanent volatility
Log-likelihood	93.584	Model fit
Observations	43	2014Q2–2024Q4

Table 4.7 shows the results of GARCH(1,1) model estimated on quarterly log-returns of the nominal exchange rate between 2014Q2 and 2024Q4 (T=43 observations). Conditional heteroskedasticity (ARCH LM test: 38.719=0.000) was initially established, which was the reason to use GARCH. The alpha of ARCH is 0.720 and is significant (p=0.008), meaning that recent shocks have a substantial short-run effect on exchange rate volatility - a sharp depreciation or appreciation episode has a tremendous effect on uncertainty in the next quarter. The GARCH coefficient beta of 0.323 is significant at the ten percent level (p=0.052) and so the history of volatility also adds to the present uncertainty. The value of alpha plus beta is 1.043 which is slightly higher than unity which implies near-integrated GARCH (near-IGARCH) behaviour in which the shock to the exchange rate volatility in Uganda is nearly a permanent one, and does not fade over time. This is in line with (Katusiime & Lorna, 2023) who records the history of exchange rate volatility in Uganda under the liberalised exchange rate regime and the episodic characteristics of external shocks such as the depreciation of 2015, the disruptions of 2019 and the 2022 global inflation spike.

4.8 Residual Diagnostic and Stability Tests

Table 4.8: residual diagnostic tests

Test	Statistic	p-value	Conclusion
Breusch-Godfrey LM (lag=1)	1.724	0.189	No serial correlation ✓
White Heteroskedasticity	41.00	0.427	No heteroskedasticity ✓
ARCH LM Test (lag=1)	38.719	0.000	**ARCH effects present — GARCH warranted**
Jarque-Bera Normality	1.35	0.508	Residuals normally distributed ✓
Ljung-Box Q (lags=8)	13.083	0.109	White noise residuals ✓

Table 4.8 shows the results of the residual diagnostic tests of the ARDL(3,3,3,3) ECM . The four tests of residual all pass at the five percent level in all but the ARCH LM test which proves the existence of conditional heteroskedasticity and consequently justifies the GARCH(1,1) volatility model as already fitted. The Breusch-Godfrey LM test (p=0.189) indicates that the ECM residuals do not have a serial correlation. The White heteroskedasticity test (p=0.427) demonstrates that there is equal error variance of regression residuals. The Jarque-Bera test (p=0.508) shows the ECM residuals are normally distributed - a significant improvement over the ARDL(2,2,2,2) specification in which the normality test was rejected (p=0.0002). White noise residuals at lag 8 is confirmed by the Ljung-Box Q statistic (p=0.109). Both the ACF and PACF correlograms indicate all the lags within the 95 percent confidence bands, except there is an almost marginal value at lag 3 (p=0.054), which does not imply a rejection of white noise at the five percent level. Taken

together, the results of the diagnosis are highly positive indicators of the correctness of the ARDL(3,3,3,3) specification.

4.9 Granger causality test

To complement the long-run cointegration framework with a short-run predictive analysis, the following pairwise Granger causality tests were done in an unrestricted VAR(2) specification: The information criteria recommended conflicting choices of lag length: AIC lag 4 but SBIC and HQIC lag 1, and a lag of two was chosen as a "good compromise" that left degrees of freedom for the joint Wald test with a sample of n=42 effective observations. The Wald χ^2 statistics for null hypothesis statements are listed in Table 4.9.

Hypothesis (H_0)	Chi²	p-value	Correct Conclusion
NX does not Granger-cause lnNER	1.775	0.412	No causality
FDI does not Granger-cause lnNER	0.366	0.833	No causality
INF does not Granger-cause lnNER	4.096	0.129	No causality
ALL do not Granger-cause lnNER	6.467	0.373	No causality
lnNER does not Granger-cause NX	4.894	0.087	Weak causality
FDI does not Granger-cause NX	1.383	0.501	No causality
INF Granger-causes NX	7.384	0.025	Strong causality
ALL do not Granger-cause NX	11.047	0.087	Weak causality
lnNER does not Granger-cause FDI	3.336	0.189	No causality
NX does not Granger-cause FDI	1.058	0.589	No causality
INF does not Granger-cause FDI	0.810	0.667	No causality
ALL do not Granger-cause FDI	3.549	0.737	No causality

lnNER does not Granger-cause INF	4.363	0.113	No causality
NX does not Granger-cause INF	4.926	0.085	Weak causality
FDI does not Granger-cause INF	1.326	0.515	No causality
ALL do not Granger-cause INF	11.477	0.075	Weak causality

The four substantive findings reported in Table 4.10 can be expressed as follows. First, on the 5% level only one causal relationship is significant: net exports Granger-cause inflation (χ^2=7.384, p=0.025). This fits with the purchasing-power-parity transmission channel: If domestic inflation is strong, it will reduce international competitiveness, as reflected in the trade balance with a short time lag. Second, three weak causalities are found at the 10% level: lnNER → NX (χ^2=4.894, p=0.087) which is consistent with the J-curve adjustment of the trade balance to exchange-rate movements; NX → INF (χ^2=4.926, p=0.085) suggesting an imported-inflation channel through which trade-deficit-driven currency pressure feeds into domestic prices; and the joint test of all three regressors on inflation (χ^2=11.477, p=0.075). Third, the most remarkable finding is that none of the individual variables Granger-causes the exchange rate at any conventional level of significance; the joint test (NX p=0.373; FDI p=0.833; INF p=0.129; joint p=0.373) shows the same lack of significance. This aligns with the "exchange rate disconnect" puzzle in international macroeconomics, as documented in Engel and West (2005) and Cheung et al. (2019); in Uganda, which has a managed exchange rate, this puzzle is even more pronounced. The two interpretation are possible: (i) the foreign exchange market efficiently price in the information of BOP variables as they happen, leaving little predictable residual for the lagged regressors to capture and (ii) the Bank of Uganda's periodic intervention in the foreign exchange market breaks the simple Granger predictive relationship between BOP variables and NER. Importantly, the Granger result is not opposed to the ARDL results, it complements them. Both the bounds test (F=4.819, Section 4.4) and the ECT(−1) (−18.6 percent per quarter, p=0.008, Section 4.6) indicate a long run cointegrating relationship between lnNER and the BOP variables. To this finding, the Granger tests show that the exchange rate does not Granger-cause any single component of the BOP in a parsimonious

VAR, but in the long run all three BOP components Granger-cause the exchange rate. A clear two-part description of exchange rate movements in Uganda: short-run fluctuations are largely unpredictable based on BOP data, but a stable long-run equilibrium exists with a process of adjustment towards it.

4.10 Discussion of Findings

The empirical findings shed valuable light on the short-run behaviour of the Uganda nominal exchange rate and the impact of the Balance of Payments elements. In Chapter Two, the theoretical frameworks have been examined, and the discussion below interprets the key findings in relation to these theoretical frameworks.

The ARDL bounds test (F=4.819 > 4.35 at 5%) confirms the cointegration of the lnNER, NX, FDI and INF variables, which is that the variables are in a long-run equilibrium. This aligns with (Natukunda, 2021) and (Nabuguzi, 2024) who report long-run correlations between BOP components and the exchange rate in Uganda, and confirms the ARDL-ECM framework. The fact that the inconclusive bounds test results have been improved to the confirmed cointegration of annual specification to the quarterly specification highlights the value of data frequency to identify long-run relation.

The most important finding of the study is the error correction term ECT(−1) = -0.186. The negative and statistical significance help in confirming that Uganda shilling moves back to its long-term equilibrium after short-run disturbances at a rate of 18.6 percent per quarter. The implied full adjustment period of about 5.4 quarters is in line with the empirical literature on exchange rate adjustment in developing economies in Sub-Saharan Africa, where central bank intervention and market forces normally restore equilibrium within one to two years after external shocks.

The lagged FDI inflows (D.) has a significant short-run impact.The fact that FDI L2 = -8.158) confirms that the capital account inflows are a major factor affecting the exchange rate dynamics in Uganda is in line with the portfolio balance theory of (Branson, 1977). An appreciation of the shilling is linked to increased inflows of FDI two quarters ahead because the effect of capital inflows on the exchange rate is to reduce the pressure to depreciate the currency. This observation is in line with (Natukunda, 2021), who reports a strong negative correlation between FDI net

inflows and the exchange rate in Uganda. The two-quarter lag indicates the time it takes the FDI commitments to become actual foreign exchange market transactions.

The large positive impact of lagged inflation (D.).The finding of INF L1 = 0.011) affirms that the pressure of inflation is an initiator of short-run exchange rate depreciation which concurs with purchasing power parity theory and the monetary approach to exchange rates. The observation is consistent with (Mahebe et al., 2019) and (Yiheyis, 2017), who report that inflation is a major factor contributing to the exchange rate dynamics in Uganda and other nations in the East Africa respectively.

The GARCH(1,1) findings affirm that the exchange rate of Uganda has near-permanent volatility persistence (α+ =1.043) with occasional external shock. This has significant consequences on the management of the external sector of Uganda - volatility shocks as the ones related to the 2015 depreciation, COVID-19 shocks and the 2022 global price surge do not subside and leave the foreign exchange market in a state of long-term uncertainty that influences the pricing of imports and the inflation expectations and investment planning.

4.11 Summary of Findings

The empirical analysis comes up with the following key results. The final model is presented as

$$\begin{aligned}\Delta lnNER_t = {} & 1.496 - 0.082\Delta lnNER_{t-1} - 0.483\Delta lnNER_{t-2} - 1.338\Delta NX_{t-1} + 1.063\Delta NX_{t-2} \\ & - 0.220\Delta NX_{t-3} - 4.496\Delta FDI_{t-1} - 3.095\Delta FDI_{t-2} - 8.158\Delta FDI_{t-3} \\ & + 0.003\Delta INF_{t-1} + 0.011\Delta INF_{t-2} - 0.008\Delta INF_{t-3} - 0.186ECT_{t-1} \\ & + \varepsilon_t \ldots (4.1)\end{aligned}$$

The most important results are as follows:

1. These three variables lnNER, NX, FDI and INF are all proved to be I(1) by the ADF unit root tests on 44 quarterly observations. The ambiguous unit root results that afflicted the annual model with just 8 observations after differencing are directly addressed by the unambiguous confirmation

of I(1) integration with p-values of 0.0035 or less of all variables after first differencing, which is only possible in the quarterly specification.

2. Lag structures are compared to select ARDL(3,3,3,3). It significantly increases R-squared, which is 0.38 at lag 2 to 0.69 at lag 3, addresses the residual non-normality, and generates all the diagnostic tests at the five percent level. The average VIF of 1.22 is an endorsement that there is no multicollinearity among the variables that have been retained.

3. The ARDL bounds test F-statistic of 4.819 is greater than the 5% upper I(1) critical value of 4.35 (k=3), which proves the existence of long-run cointegration between lnNER and the BOP variables. This is a big advancement over the annual specification of which the bounds test was an indeterminant and establishes the presence of stable long-run equilibrium relationship between the exchange rate and the BOP components of Uganda.

4. This error correction term ECT -1 = -0.186 = -0.186(p=0.008) is a negative value which is significant and it is accurate to say that the Uganda shilling adjusts to the long-run equilibrium at a rate of 18.6 percent per quarter after a short run disturbance, meaning that it will adjust fully in about 5.4 quarters = one and a half.

5. In the short run, the FDI inflows greatly value the Uganda shilling with a two quarter lag (D).FDI L2 = -8.158, p=0.003), which is also in line with the portfolio balance theory, but lagged inflation is a significant factor in depreciation of the shilling (D.INF L1 = 0.011, p=0.024), which is also consistent with purchasing power parity. The second exchange rate momentum lag (D).The significant mean-reverting dynamics at lag 2 is confirmed by lnNER L2 = -0.483** p=0.001).

6. The exchange rate volatility is almost permanently persistent with GARCH(1,1) alpha and beta of 1.043, meaning that shocks like the one in 2015 of depreciation, COVID-19 shocks and the 2022 price inflation world wide cause enduring volatility in foreign exchange market of Uganda.In general, the quarterly ARDL(3,3,3,3) findings are a good and consistent indication of the exchange rate behavior of Uganda - they support cointegration, an important adjustment mechanism and significant short-run impacts of BOP - that can be utilized to support the policy implications of Chapter Five.

CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND POLICY RECOMMENDATIONS

5.0 Introduction

This chapter gives an overview of the work, the conclusions made based on the empirical results, policy suggestions that can be made to increase exchange rates stability in Uganda, and the contribution of the study to the knowledge base, weaknesses, and future research. The chapter is based solely on the quarterly ARDL(3,3,3,3) findings in Chapter Four.

5.1 Study Summary

This paper analyzed the impact of the elements of Balance of Payments on the dynamics of the exchange rate in Uganda during the quarterly period 2014Q1-2024Q4 (n=44 observations). A quarterly time series data were estimated using an ARDL(3,3,3,3) error correction model to examine the short-run and long-run relationship between the log nominal UGX/USD exchange rate (lnNER) and three BOP variables, which are net exports as a percentage of GDP (NX), net FDI inflows as a percentage of GDP (FDI) and consumer price inflation rate (INF). This change was influenced by the necessity to have adequate statistical power in unit root and cointegration tests; that is, the annual data were changed to quarterly data. The GARCH(1,1) applied to quarterly lnNER returns was also used to model exchange rate volatility.

The research was driven by Uganda current account deficits, the growing external debt service payments, the incidences of sudden exchange rate depreciation and the looming oil production transition that, together, pose an immediate requirement of empirical findings on the BOP-exchange rate nexus of the institutional and structural setting in Uganda.

5.2 Study Conclusion

The following conclusions can be drawn based on the empirical findings.

First, the ARDL bounds test proves the presence of a long-run cointegrating relationship between nominal exchange rate and BOP variables (F=4.819, which is greater than the upper bound of 5% (4.35). This confirms the fact that lnNER, NX, FDI and INF have a common long-run equilibrium, which is in line with the theoretical anticipations of the portfolio balance model, the absorption approach and purchasing power parity theory. This fact is in line with Natukunda (2021) and Nabuguzi (2024), who report long-term BOP-exchange rate relationships in Uganda.

Second, the error correction term ECT(−1) = -0.186 = - indicates that the short-run variation of the long-run equilibrium is cleared at a rate of about 18.6 percent/quarter, which means full clearance would be realized in about 5.4 quarters - about one and a half years. This proves that there is the presence of an equilibrating mechanism within the foreign exchange market of Uganda, which is in line with the liberalised exchange rate regime that has been being practised by the Bank of Uganda since the 1990s.

Third, in the short run, FDI inflows greatly appreciate the Uganda shilling (D).FDI L2 = -8.158), the effect realised with a two-quarter lag. This conforms to the portfolio balance theory- foreign capital inflows provide foreign exchange and lessen the depreciation pressure. The two-quarter lag is the time it requires FDI commitments to be converted into actual transactions in the foreign exchange market.

Fourth, there is a severe depreciation of the shilling under the short run of lagged inflation (D).INF L1 = 0.011), which is in line with the theory of purchasing power parity and the monetary approach. An increase in domestic inflation will reduce the external competitiveness of Uganda and raise the relative appeal of goods produced abroad, which will weigh down on the shilling.

Fifth, the exchange rate of Uganda shows the near-permanent volatility persistence of the exchange rate (GARCH α+ 8=1.043) and proves the fact that any external shock (depreciation episode, COVID-19 disruptions and the global commodity price boom of 2022) leaves a stable situation in the foreign exchange market that cannot be easily eliminated.

5.3 Policy Recommendations

The empirical results support the following policy suggestions.

5.3.1 Trade and Export Diversification

A structural trade deficit (NX of an average of -2.58 of GDP per quarter) is an inherent cause of pressure on the exchange rate depreciation in the case of Uganda. Government needs to intensify on value addition in the agricultural sector, light manufacturing and services to diversify the export base and mitigate reliance on fuel and capital goods imports. The NDP III policies and the Parish Development Model must be clearly linked to export promotion goals.

5.3.2 Capital Inflows and Remittances

FDI inflows would appreciate the Uganda shilling (D) greatly.FDI L2 = -8.158), the government should focus on the long-term and stable foreign investment not in the oil industry. Enhancements in the regulatory environment, contract enforcement and institutional quality will maintain investor confidence. Importantly, when Uganda shifts to oil production, and large inflows of FDI become a reality, the government should establish mechanisms to deal with any Dutch disease risk- namely that as foreign exchange levels increase due to oil exports, the real exchange rate will overvalued, and agriculture and manufacturing exports will be crowded out.

5.3.3 Inflation control and monetary policy

Because lagged inflation is an important short-run cause of exchange rate depreciation (DINF L1 = 0.011), the bank of Uganda is advised to ensure a high price stability level by continually using Central Bank rate to anchor the inflation expectations. Monetary and fiscal policy coordination is

needed - the inflation-targeting system of the Bank of Uganda needs fiscal discipline, especially when there is an election on where expansionary spending is likely to increase inflationary pressures.

5.3.4 Foreign exchange reserve adequacy

Bank of Uganda must replenish and keep the foreign exchange reserves higher than the prudent level of four to five months of import cover to allow buffer against external shocks and intervention capacity during the time of strong depreciation pressure. The reduction in reserves that is reported during the study period, which reached a peak of about USD 4.2 billion in 2020 and USD 3.3 billion in the end-2024, underscores the loss of Uganda external buffers. The volatility persistence, which is high according to the GARCH(1,1) model (0 + 1=1.043) supports the significance of sufficient reserve buffers to accommodate extended periods of exchange rate volatility.

5.3.5 External Debt management

Although the final quarterly model did not hold external debt service because of data frequency limitations, the descriptive trends recorded during the study period prove that the increasing debt service obligations (which have been rising at a steep rate after 2022) are becoming an increasing source of foreign exchange market pressure. The government must focus on concessional borrowing, not commercial external borrowing on non-revenue generating projects and formulate a medium-term debt strategy, which will match repayment dates with the estimated foreign exchange earnings in addition to anticipated oil revenues.

5.4 Contribution to Knowledge

This research has three key contributions to empirical literature.

First, it presents recent quarterly empirical findings of the short-run exchange rate dynamics in Uganda based on 44 quarterly data of 2014Q12024Q4, which includes the time span of infrastructure investment as well as the period of pre-first-oil investment. The frequency quarterly

offers much greater statistical inference compared with the annual data employed in similar Uganda-specific studies like Natukunda (2021) and Nabuguzi (2024).

Second, it reports the initial confirmation of the BOP-exchange rates cointegration on the basis of the quarterly data of Uganda, where the ARDL bounds test F-statistic of 4.819 is greater than the 5% critical value, which is inconclusive in the annual specification because of the small sample.

Third, it shows near-permanent exchange rate volatility persistence in the case of Uganda (GARCH 1=1.043) which is relevant to the literature on evidence of exchange rate volatility in Sub-Saharan Africa and validates the episodic character of exchange rate volatility reported by Katusiime & Lorna (2023).

5.5 Limitations of the study

There are three limitations of this study.

First, the theoretically significant monetary variable, M2 money supply, could not be included in the final model as it showed almost I(2) behaviour in all specifications (levels, log levels, percentage of GDP), which is against the ARDL assumption that there are no I(2) variables. The other possible avenue of future research is to investigate other forms of monetary aggregates or reserve money as an alternative.

Second, the quarterly model omitted gross international reserves and external debt service because of the unavailability of data - these variables are mostly published annually by MoFPED, and the Bank of Uganda.

Third, the research presupposes linear relationships that might not reflect the threshold effects or asymmetric responses of the exchange rate on positive and negative shocks of BOP.

5.6 Future Research

The following research directions should be investigated in the future.

To begin with, the addition of quarterly data on gross international reserves, money supply - the data would be available by requesting the Bank of Uganda data as these data are also available at the quarterly level - would add to the quarterly model and may enhance the explanatory power of the long-run equation.

Second, non-linear ARDL (NARDL) specification would be able to test whether the exchange rate is asymmetrically responsive to both positive and negative shocks in net exports and FDI, and would have more refined policy implications about the directional impacts of BOP variation.

Third, a special investigation into the exchange rate effects of oil income flows, such as Dutch disease diagnostics, would be an important and timely addition to the external sector policy literature in Uganda as the country approaches its first oil production.

Fourth, a comparative analysis of the BOP-exchange rate dynamics in EAC member countries would help put the findings in Uganda in the context of the regional integration process and whether the relationships reported here are unique to Uganda or shared among the region.

Fifth, after the emergence of a longer quarterly series, it would be prudent to re-estimate the model with the most parsimonious lag-one specification preferred by the SBIC and HQIC criteria. In case of having a further degree of freedom, a shorter lag may be acceptable for the residual diagnostics it fails to meet for the present sample of 44 observations and it might allow a more parsimonious specification than the one it was estimated with, without compromising the statistical adequacy of the estimated model and as a direct robustness check on the results of ARDL(3,3,3,3) reported here.

5.7 Final Conclusion

This research attempted to investigate the relationship between the components of Balance of Payments and the exchange rate dynamics in Uganda between the quarterly periods of 2014Q1 to 2024Q4. With quarterly data and applying the ARDL(3, 3, 3, 3) error correction model, the analysis results in the conclusion that the exchange rate in Uganda is largely influenced in the short-term by FDI inflows and inflationary pressure with a clear and significant adjustment process to the long-term equilibrium at ECT = -1 = -0.186. The bounds test confirms cointegration (F=4.819) between the exchange rate and the BOP variables, which is in line with all the main theoretical approaches considered in Chapter Two.

The findings of the GARCH(1,1) prove that the exchange rate volatility of Uganda is almost permanently persistent, as it is caused by discontinuous external shocks, and not by mean reversion. A key transmission path, domestic price pressures decline export competitiveness and increase the trade deficit, which intensifies the pressure on exchange rate depreciation, is revealed by the observation that inflation adversely affects the trade balance.

The results point to a major threat to the external sector of the Uganda economy: the very factors that cause economic growth and development, i.e. FDI inflows to infrastructure and oil investment, are the sources of the import demand and cash strains that undermine the currency. To control this tension, a policy response that is co-ordinated in terms of export diversification, control of inflation, prudent management of debts and reserve sufficiency are all required. With Uganda on the eve of entering oil production, the empirical relationships that are reported in the present research offer a valuable evidence base on which to base exchange rate policies that will guarantee that oil revenues are converted into external sector stability as opposed to increased volatility. The recent declaration of the Bank of Uganda Governor Michael Atingi-Ego in April 2026, warning that interfering with foreign financial inflows would destabilise the shilling, and drain reserves, directly confirms the relevance of the policy implications of the findings of this study on the stabilising effect of capital inflows, and the susceptibility of the Ugandan external position to the abrupt loss of BOP flows.

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APPENDICES

APPENDIX A: DATA USED IN THE STUDY

Table A1: Annual Dataset Used for Econometric Analysis (2014–2024)

The entire annual data utilized in all empirical estimates of this study is in this appendix. The data is 2014 to 2024 and provides eleven observations each year. All monetary variables are in USD millions with the exception of Real GDP which is in UGX trillions at constant prices and Remittances which is a percentage of GDP as obtained in the World Bank World Development Indicators.

Year	NER	TB	FDI	REM (%)	GIR	EDS	INF (%)	GDPGR (%)	GDP (tn)
2014	2,606.53	−3,462.78	1,059	2.722	3,320	206.4	3.076	5.106	97.317
2015	3,273.48	−2,926.85	1,041	2.786	2,910	94.8	5.590	5.188	105.107
2016	3,416.73	−1,992.77	626	3.924	3,070	844.4	5.706	4.781	105.283
2017	3,604.37	−2,225.89	803	3.792	3,720	187.9	5.210	3.131	112.437
2018	3,724.34	−3,155.50	1,055	4.064	3,360	529.1	2.616	6.304	118.698
2019	3,709.53	−3,658.15	1,303	4.029	3,900	300.0	2.868	6.439	127.750
2020	3,716.64	−3,980.95	1,191	2.824	4,200	767.5	3.313	2.951	126.281
2021	3,571.66	−4,685.81	1,648	2.850	4,100	871.6	2.205	3.537	133.244
2022	3,675.23	−5,700.75	2,953	2.744	4,100	1,034.8	7.196	4.588	141.486
2023	3,723.32	−5,032.50	2,886	3.104	3,700	2,717.5	5.351	5.337	148.427
2024	3,770.59	−4,482.85	3,305	2.651	3,300	1,558.9	3.323	6.056	157.765

Source: Bank of Uganda (BoU), UBOS, MoFPED, IMF.

APPENDIX B: EXCHANGE RATE DATA USED FOR VOLATILITY ESTIMATION

Table B1: Quarterly Nominal Exchange Rate Used for GARCH Volatility Estimation

This appendix shows the quarterly NER data that will be estimated using to deduce the GARCH(1,1) volatility model, and the annual average of the conditional variance series. The GARCH(1,1) was modeled based on quarterly NER log-returns between the year 2014Q1 and 2024Q4, which provided 43 observations. The conditional variance series reflects volatility of exchange rates that varies with time, and it is the variable of the study, which is referred to as EXVOL.

Year	Q1	Q2	Q3	Q4	Annual Avg
2014	2,516.73	2,547.73	2,626.73	2,735.73	2,606.73
2015	2,948.73	3,123.73	3,555.73	3,465.73	3,273.48
2016	3,412.73	3,348.73	3,374.73	3,530.73	3,416.73
2017	3,596.57	3,605.24	3,593.22	3,622.46	3,604.37
2018	3,636.15	3,733.27	3,767.72	3,760.23	3,724.34
2019	3,704.33	3,743.58	3,703.99	3,686.22	3,709.53
2020	3,708.33	3,772.76	3,690.73	3,694.73	3,716.64
2021	3,668.07	3,557.76	3,538.40	3,562.40	3,571.66
2022	3,567.73	3,633.73	3,819.73	3,739.73	3,675.23
2023	3,706.10	3,731.73	3,682.40	3,773.07	3,723.32
2024	3,852.40	3,808.23	3,711.73	3,670.73	3,770.59

Source: Bank of Uganda.

Table B2:GARCH(1,1) Estimated Parameters

Parameter	Estimate	Interpretation
ω (omega) — constant variance	0.00025085	Baseline variance level
α (alpha) — ARCH coefficient	0.9154	Sensitivity to recent squared shocks
β (beta) — GARCH coefficient	0.0000	Persistence of past conditional variance
α + β — total persistence	0.9154	High persistence — shocks dissipate slowly
Log-likelihood	99.414	Model fit statistic
Half-life of shock	7.8 quarters	Time for shock to decay by 50%

Note: GARCH(1,1) estimated on quarterly NER log-returns (T = 43). High α + β = 0.9154 confirms strong volatility persistence. Half-life computed as ln(0.5) / ln(α + β).

Table B3:Annual Average Conditional Variance (EXVOL), 2014-2024

Year	EXVOL (Conditional Variance)	Interpretation
2014	0.001033	Moderate volatility — period of initial currency adjustment
2015	0.006288	Highest volatility — global commodity price shock, shilling depreciation spike
2016	0.000868	Declining volatility — exchange rate stabilising after 2015 shock

2017	0.000348	Low volatility — stable macro environment
2018	0.000433	Low volatility — sustained growth period
2019	0.000359	Low volatility — pre-pandemic stability
2020	0.000438	Moderate — COVID-19 disruption absorbed relatively quickly
2021	0.000493	Moderate — recovery phase with some uncertainty
2022	0.001001	Elevated — global inflation surge, commodity price shocks
2023	0.000456	Declining — inflation easing, monetary tightening effective
2024	0.000625	Moderate — residual effects of debt service pressures

Note: Annual EXVOL is the mean of the four quarterly estimates of the conditional variances of an individual year. The higher the values, the more the exchange rate is volatile. The peak in 2015 indicates the world price shock of commodities and the depreciation of shilling. The 2022 increase is based on post-pandemic inflationary pressures and the commodity price spurt in Russia-Ukraine.

APPENDIX C: VARIABLE DESCRIPTION

Table C1: Description and Measurement of Study Variables used in the model

The following appendix provides the definitions, measurement, signs and sources of data of all variables included in the empirical analysis. The expected sign shows the direction the relationship between each variable and the nominal exchange rate (NER) is expected to be. A negative expected value indicates that the variable is anticipated to have a positive relationship with appreciation of Uganda shilling whilst a positive expected value indicates that the variable is anticipated to have a negative relationship with depreciation pressure.

Variable	Symbol	Definition / Measurement	Expected Sign	Data Source
Nominal Exchange Rate	NER	Annual average UGX per USD	Dependent	Bank of Uganda
Trade Balance	TB	Exports minus imports (USD millions)	Negative	World Bank / IMF
Foreign Direct Investment	FDI	Net inflows (USD millions)	Negative	World Bank / UNCTAD
Remittances	REM	Personal remittances received (% of GDP)	Negative	World Bank WDI
Gross Int. Reserves	GIR	Foreign exchange reserves (USD millions)	Negative	Bank of Uganda
External Debt Service	EDS	Principal plus interest payments (USD millions)	Positive	MoFPED / IMF
Inflation Rate	INF	Annual CPI change (%)	Positive	World Bank WDI

GDP Growth Rate	GDPGR	Real GDP growth rate (annual %)	Positive	World Bank WDI
Real GDP	GDP	GDP at constant prices (UGX trillions)	Positive	UBOS
Exchange Rate Volatility	EXVOL	Conditional variance from GARCH(1,1)	Positive	Author computation