

Domestic Drivers of Uganda's Reserves: An Empirical Analysis of Consumption, Investment, and Public Debt

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Abstract

International reserves are essential for maintaining macroeconomic stability and resilience against external shocks in developing economies. Declining reserve adequacy amid rising consumption, import-intensive investment, and increasing public debt has raised concerns about external sector sustainability. Existing empirical studies have predominantly emphasized external determinants of reserve accumulation, with limited attention to domestic macroeconomic factors, creating a knowledge gap. This study examined the effects of private consumption, total investment, and gross government debt on Uganda's international reserves during 1969–2024. It examined the effects of private consumption, total investment, and gross government debt on international reserves. Guided by the precautionary motive, mercantilist, and debt vulnerability theories, the study adopted a quantitative time-series research design using annual secondary data obtained from the Bank of Uganda, Uganda Bureau of Statistics, and the World Bank. A Vector Error Correction Model was employed because unit root and Johansen cointegration tests confirmed long-run relationships among the variables. The findings indicate that private consumption significantly reduces international reserves, investment has a positive but weak effect, while government debt has a positive but statistically insignificant effect. The study recommends promoting productive investment, prudent debt management, and policies that moderate import-driven consumption to strengthen reserve adequacy and long-term macroeconomic stability.

Keywords: *International reserves, private consumption, investment, government debt, VECM, and, Uganda.*

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Introduction and Background

International reserves constitute a critical component of macroeconomic stability, particularly in open developing economies that are vulnerable to external shocks and fluctuations in international financial markets (Mah, 2015). International reserves comprise official holdings of foreign exchange assets, monetary gold, Special Drawing Rights (SDRs), and reserve positions with the International Monetary Fund (IMF, 2022). These reserves serve several important functions, including facilitating international payments, supporting exchange rate management, enhancing investor confidence, and providing a buffer against external economic disturbances (IMF, 2022). For low-income countries such as Uganda, where export earnings remain concentrated in a few primary commodities and external financing needs are substantial, maintaining adequate reserve levels is an important policy objective (Aizenman & Lee, 2007; Todaro & Smith, 2020).

Uganda's increasing integration into the global economy through trade, investment, and financial flows has enhanced economic opportunities but also heightened its vulnerability to external shocks, including commodity price fluctuations, exchange rate volatility, and global economic downturns (Arineitwe, Olyanga, & Abigaba, 2026). Uganda's foreign exchange reserves have experienced fluctuations in recent years due to elevated import demand, rising external debt servicing obligations, and the lingering effects of global crises (BoU, 2023). While reserve levels have generally remained sufficient to support imports and stabilize the exchange rate, recent declines have generated concerns regarding reserve adequacy and the country's ability to withstand future external shocks (BoU, 2023; Arineitwe, Olyanga, & Abigaba, 2026). Given Uganda's managed floating exchange rate regime, adequate reserves remain essential for mitigating excessive exchange rate volatility and safeguarding macroeconomic stability (BoU, 2023). Among the domestic factors that may influence reserve accumulation, private consumption plays a significant role. Private consumption refers to household expenditure on goods and services; total investment represents expenditure on physical capital, infrastructure, and productive assets that enhance future economic capacity (Mankiw, 2021; World Bank, 2024a). Household final consumption expenditure accounts for more than two-thirds of Uganda's Gross Domestic Product (GDP), making it the largest component of aggregate demand (UBOS, 2023). Although rising consumption contributes positively to economic growth and household welfare, it can also increase demand for imported consumer goods in economies with limited domestic production capacity (MoFPED, 2024b; Mankiw, 2021). Such import-dependent consumption patterns generate foreign exchange outflows

that may reduce reserve holdings and weaken the external position of the economy (Todaro & Smith, 2020; Mankiw, 2021; Mah, 2015).

Similarly, total investment represents an important determinant of reserve dynamics. Total investment represents expenditure on physical capital, infrastructure, machinery, and other productive assets that increase an economy's productive capacity and support long-term economic growth (Todaro & Smith, 2020; World Bank, 2024b). It often requires substantial imports of machinery, equipment, and intermediate goods, particularly in developing countries (Obstfeld, Shambaugh, & Taylor, 2010). In Uganda, both public and private investment have expanded significantly in sectors such as transport, energy, and construction, largely supported by government infrastructure programs and private sector participation (World Bank, 2023). While such investments may eventually stimulate exports and foreign exchange earnings, their import-intensive nature may exert short-term pressure on international reserves before long-term gains are realized (UBOS, 2023).

Government debt has become an important determinant of reserve accumulation in Uganda. Gross government debt refers to the total outstanding financial obligations of the government arising from domestic and external borrowing, including debt used to finance public investment, government operations, and development programmes (IMF, 2023b; MoFPED, 2024a). Over the past decade, Uganda's total public debt has increased substantially, rising from approximately UGX 35 trillion in 2014 to over UGX 107 trillion by June 2024, reflecting increased borrowing to finance infrastructure development, social programs, and economic recovery initiatives (MoFPED, 2024b; NPA, 2025). While this borrowing has financed key infrastructure and development projects, increasing debt service obligations require substantial foreign currency payments especially for external debt, thereby reducing international reserves (World Bank, 2023). High debt levels may also weaken investor confidence, raise borrowing costs, and limit access to external financing, further constraining reserve accumulation (Reinhart & Rogoff, 2010). Consequently, recent policy discussions have emphasized prudent debt management and stronger domestic revenue mobilization to safeguard external sector stability (Arineitwe, Olyanga, & Abigaba, 2026).

The existing literature has primarily emphasized external determinants of reserves, including trade balances, capital inflows, and exchange rate dynamics, while giving less attention to the role of domestic demand and fiscal policy variables (Jeanne & Rancière, 2011; Ghosh, Ostry, & Qureshi, 2017). This omission is particularly relevant for Uganda, where rising consumption, investment-related imports, and growing public debt may exert considerable pressure on reserve accumulation and external sector sustainability (IMF, 2024).

Recent evidence indicates that Uganda's foreign exchange reserves have declined to about 3–3.5 months of import cover, below the recommended benchmark of four (04) months (BoU, 2023; IMF, 2023b). This decline has been driven by rising import demand, increasing debt service obligations, and strong domestic consumption. If sustained, these pressures may threaten exchange rate stability, external sector resilience, and the achievement of national and international development goals, including NDP III, the African Union Agenda 2063, and Sustainable Development Goal 8 (Bussière, Cheng, Chinn, & Lisack, 2015).

Against this background, the study addresses the following research question: How do private consumption, total investment, and general government gross debt influence total international reserves in Uganda? To answer this question, the study employs the Vector Error Correction Model (VECM), which is appropriate for examining both short-run dynamics and long-run relationships among cointegrated variables (Johansen, 1988; Engle & Granger, 1987; Enders, 2015).

Literature review

The literature on international reserves accumulation is grounded in several theoretical perspectives that explain why countries hold foreign exchange reserves and the factors that influence reserve dynamics. This study is guided by three complementary theoretical perspectives: the precautionary motive theory, the mercantilist approach, and the debt vulnerability hypothesis. The precautionary motive theory explains that countries accumulate international reserves primarily as a form of self-insurance against external economic shocks, including sudden stops in capital inflows, exchange rate volatility, commodity price fluctuations, and balance of payments crises (Reinhart & Rogoff, 2010). The central argument of this theory is that because international financial markets are imperfect and external shocks are unpredictable, governments maintain reserve buffers to enhance economic resilience and preserve macroeconomic stability (Obstfeld, 2016).

The theory suggests that countries with greater exposure to global financial uncertainty and external vulnerabilities require higher levels of reserves to absorb shocks and maintain confidence in their economies. Empirical studies provide support for this argument, showing that financially open economies with volatile capital flows tend to hold larger reserve balances as a stabilization mechanism (Aizenman & Lee, 2007; Ghosh, Ostry, & Qureshi, 2017). In the context of this study, the precautionary motive theory informs the investigation of government gross debt as a determinant of international reserves. Rising public debt, particularly external debt, increases a country's exposure to foreign currency obligations and repayment pressures, thereby creating a greater demand for foreign exchange liquidity (Gergely, Ferenc, & Zsolt). Therefore, government debt is operationalized as an indicator of macroeconomic vulnerability that may influence reserve accumulation. The theory predicts a negative relationship between government gross debt and international reserves because increasing debt obligations may divert foreign exchange resources away from reserve accumulation toward debt servicing. Examining this relationship in Uganda provides an opportunity to test whether reserve accumulation follows the precautionary logic in a developing economy characterized by increasing public borrowing and external financing requirements (de Fontenay & Pill, 1995).

The mercantilist approach provides another explanation for reserve accumulation by emphasizing the role of reserves in promoting export competitiveness, maintaining exchange rate stability, and supporting economic growth. Unlike the precautionary motive, which views reserves primarily as a protection mechanism, the mercantilist perspective argues that countries may deliberately accumulate reserves to influence exchange rate conditions and strengthen their external competitiveness (Aizenman & Lee, 2007; IMF, 2024). Under this framework, productive investment is expected to enhance reserve accumulation by expanding domestic production capacity, improving export performance, and increasing foreign exchange earnings (Ozili, 2024). Consequently, total investment is included in this study as a key explanatory variable because investment-driven economic expansion may strengthen Uganda's capacity to generate foreign currency inflows (Abiodun, 2025). The theory therefore suggests a positive relationship between investment and international reserves. However, in developing economies where investment relies heavily on imported capital goods and intermediate inputs, increased investment may initially generate higher foreign exchange outflows (Abayomi, 2023). Thus, empirical examination is necessary to establish whether investment in Uganda contributes to reserve accumulation or increases pressure on foreign exchange resources.

The debt vulnerability hypothesis further strengthens the theoretical foundation of this study by emphasizing the relationship between public debt and external liquidity conditions. This hypothesis argues that high

and increasing levels of public debt weaken a country's external position by increasing foreign exchange requirements for debt repayment and reducing fiscal flexibility (Obstfeld, 2016; Reinhart & Rogoff, 2016). Countries with large debt obligations may experience declining reserve accumulation because available foreign exchange resources are directed toward servicing external liabilities rather than strengthening reserve buffers (Yusuf & Musa, 2025). Recent evidence from the International Monetary Fund indicates that economies experiencing rising debt burdens often face challenges in maintaining adequate reserve levels due to fiscal constraints, increased financing needs, and external repayment pressures (IMF, 2023b). For Uganda, where public debt has expanded significantly due to infrastructure investment and development financing needs, understanding the effect of government gross debt on international reserves is important for assessing external sustainability (IMF, 2023b).

Empirical studies show that international reserve accumulation is largely influenced by macroeconomic factors such as financial integration, exchange rate volatility, capital flow instability, and external vulnerability. For example, Bussière et al. (2016) and Ghosh et al. (2017) demonstrate that emerging and developing economies with greater exposure to international financial markets tend to maintain higher reserve holdings to protect against external shocks. Similarly, Aizenman et al. (2017) find that exchange rate instability and capital account openness encourage countries to accumulate reserves as a stabilization strategy. Although these studies provide important insights into reserve behavior, their reliance on panel data approaches limits their ability to capture country-specific structural characteristics and domestic economic conditions (Aizenman & Lee, 2007; Bussière, Cheng, Chinn, & Lisack, 2015; Ghosh, Ostry, & Qureshi, 2017).

Recent literature has increasingly recognized the importance of fiscal and domestic macroeconomic factors in explaining reserve dynamics. Reinhart and Rogoff (2016) argue that increasing public debt weakens external liquidity positions by increasing foreign currency obligations and reducing policy flexibility. Similarly, IMF (2023) country surveillance reports indicate that countries experiencing debt accumulation often face difficulties in expanding reserve buffers because fiscal resources are increasingly committed to debt repayment and financing obligations. However, much of the existing literature focuses on debt sustainability and external vulnerability without directly examining the effect of government debt on international reserves, particularly in low-income economies.

Domestic demand factors have also received growing attention in explaining reserve movements. Private consumption is considered an important determinant because increases in consumption expenditure can influence imports and foreign exchange demand. Studies by Mah (2017) and Gabrisch & Holtemöller (2018) show that in small open economies, consumption-driven import growth can reduce reserve holdings by increasing foreign exchange outflows. However, the effect may vary depending on whether consumption stimulates domestic production or primarily increases demand for imported goods (Gabrisch & Holtemöller, 2018). In import-dependent economies, higher private consumption increases demand for imported goods and services, thereby raising foreign exchange requirements and exerting pressure on international reserves. Consequently, this study examines private consumption as a determinant of international reserves, expecting that rising consumption levels will negatively affect reserve accumulation in Uganda.

Investment influences international reserves by affecting productive capacity, export competitiveness, and foreign exchange earnings. While productive investment can strengthen reserve accumulation, import-intensive investment may increase foreign exchange demand in the short run (Adegboye, Adesina, Ojeka, Akinjare, & Olokoyo, 2020).

However, evidence on this relationship remains limited for Uganda, creating a research gap that this study seeks to address.

In Uganda, reserve accumulation is constrained by structural challenges such as import dependence, rising private consumption, increasing public debt, and reliance on external financing (World Bank, 2024a). While existing studies largely focus on external determinants, including exports, foreign direct investment, exchange rates, and capital flows, limited empirical evidence examines the influence of domestic macroeconomic factors such as private consumption, investment, and fiscal conditions on international reserve accumulation (Sallau, 2025). This study addresses these gaps by examining the effects of private consumption, total investment, and government gross debt on international reserves in Uganda using a country-specific approach. It contributes to the literature by providing empirical evidence on how domestic demand, investment, and fiscal pressures influence reserve accumulation within Uganda's unique economic context.

The review identified three key gaps: limited integration of domestic macroeconomic variables in reserve accumulation studies, heavy reliance on cross-country analyses that overlook country-specific dynamics, and limited empirical evidence on Uganda despite rising import dependence and public debt. Accordingly, the study hypothesizes that private consumption and government gross debt negatively affect international reserves, while total investment has a positive effect on reserve accumulation.

Methodology

This study adopts a quantitative research design based on time-series econometric analysis to examine both the short-run and long-run relationships between Uganda's total reserves (TR), private consumption (PC), total investment (TI), and government gross debt (GGGD) over the period 1969–2024. The period 1969–2024 was selected to capture Uganda's long-term macroeconomic evolution, including policy reforms, structural changes, and shifts in debt, investment, consumption, and reserve management (World Bank, 2024). The choice of a time-series framework is motivated by the need to capture dynamic macroeconomic interactions over time, which cannot be adequately modelled using static regression or cross-sectional techniques (Enders, 2015). Recent macroeconomic studies emphasize that time-series approaches are more appropriate for analysing reserve dynamics due to their ability to capture persistence, shocks, and structural adjustments (Stock & Watson, 2019; Enders, 2015).

A Vector Error Correction Model (VECM) is preferred over alternative approaches such as Ordinary Least Squares (OLS) and single-equation autoregressive models due to the $I(1)$ nature of the variables, as it is specifically designed to handle non-stationary series that are cointegrated while capturing both short-run dynamics and long-run equilibrium relationships (Stock & Watson, 2019). Contemporary econometric literature shows that VECM is particularly suitable in macroeconomic systems where variables are mutually interdependent and cointegrated (Hansen & Shin, 2018). Preliminary unit root tests confirm that all variables are integrated of order one, $I(1)$, while the Johansen cointegration test indicates the presence of at least one long-run equilibrium relationship among the variables (Johansen, 1988). This justifies the application of the VECM framework, which incorporates an error correction term (ECT) to measure the speed at which deviations from long-run equilibrium are corrected over time (Johansen, 1991; Enders, 2015).

The empirical model is specified within a log-linear time series framework, where the natural logarithm of total international reserves ($\ln TR$) is expressed as a function of private consumption ($\ln PC$), total

investment (lnTI), and gross government debt (lnGGGD). The baseline long-run relationship is specified as:

$$\ln(TR_t)=\beta_0+\beta_1 \ln(PC_t)+\beta_2 \ln(TI_t)+\beta_3 \ln(GGGD_t)+\varepsilon_t.....(3.1)$$

where ln (TRt) represents the natural logarithm of total international reserves, ln (PCt) is private consumption, ln (TIt) is total investment, ln (GGGDt) is gross government debt, β₀ is the intercept, β₁–β₃ represent long-run elasticities, and εt is the stochastic error term.

Given that all variables are integrated of order one, I(1), and cointegrated, the dynamic specification is estimated using a Vector Error Correction Model (VECM):

$$\Delta Y_t=\Gamma_1 \Delta Y_{t-1}+....+\Gamma_{p-1} \Delta Y_{t-p}+I+\Pi Y_{t-1}+\mu_t.....(3.2)$$

where Y_t=[ln(TR_t),ln(PC_t),ln(TI_t),ln(GGGD_t)]', Δ denotes first differences capturing short-run dynamics, Γi represents short-run coefficient matrices, Π captures long-run cointegrating relationships, and μt is a vector of white noise error terms.

The error correction representation for the reserve equation is expressed as:

$$\Delta \ln(TR_t)=\alpha_0+\sum \alpha_i \Delta X_{t-i}+\lambda ECT_{t-1}+\mu_t.....(3.3)$$

where ECTt–1 is the lagged error correction term derived from the long-run equilibrium relationship and λ measures the speed of adjustment back to equilibrium following short-run shocks.

The study utilizes secondary annual data obtained from the Bank of Uganda (BoU), Uganda Bureau of Statistics (UBOS), and the World Bank's World Development Indicators (WDI). The use of these internationally recognized data sources enhances reliability, comparability, and robustness of the empirical results, consistent with best practices in macroeconomic time-series research (World Bank, 2024b). All variables are transformed into natural logarithms to reduce heteroskedasticity and allow elasticity-based interpretation of coefficients, a common practice in recent empirical macroeconomic studies (Stock & Watson, 2019).

The VECM specification includes lagged first differences of all variables to capture short-run dynamics, while the error correction term derived from the Johansen cointegration equation represents the speed of adjustment toward long-run equilibrium (Pesaran, Shin, & Smith, 2016). In the long-run structure, total reserves are normalized as the dependent variable to facilitate interpretation of equilibrium relationships, a standard approach in applied macroeconomic VECM studies (Enders, 2015).

Model robustness is ensured through diagnostic testing for serial correlation, heteroskedasticity, and normality, which are widely recommended in modern time-series econometrics (Pesaran, Shin, & Smith, 2016). Since the study relies entirely on secondary data from official sources, ethical risks are minimal, and the use of reproducible datasets enhances transparency and allows replication of results.

Findings and Analysis

This section presents and discusses the empirical results of the study.

Stationarity Properties of the Data

Table 1 below presents the results of the Dickey–Fuller unit root tests for both the original (level) and first-differenced variables used in the analysis.

Table 1: Dickey–Fuller Unit Root Test Results for Economic Variables in Uganda

Variable	ADF Statistic	P-value	ADF Statistic	P-value	Integration Order
TR	-0.854	0.8029	-7.821	0.0000	I(1)
PC	-1.769	0.3961	-6.484	0.0000	I(1)
TI	-1.291	0.6332	-6.817	0.0000	I(1)
GGGD	-1.108	0.7121	-3.611	0.0056	I(1)

Source: STATA 17 (2026).

The unit root results reported in Table 1 indicate that all variables are non-stationary at levels but become stationary after first differencing which confirms that each variable is integrated of order one, I(1) (Kilian & Lütkepohl, 2017). This finding is consistent with established macroeconomic theory and recent empirical studies which show that macroeconomic aggregates such as reserves, consumption, and fiscal variables typically exhibit stochastic trends over time (Enders, 2015). The implication of this result is that traditional regression techniques would be inappropriate due to the risk of spurious estimation. Instead, the evidence justifies the use of cointegration-based modelling, particularly the VECM framework, which is designed to capture both long-run equilibrium relationships and short-run dynamics among I(1) variables (Enders, 2015).

Lag Structure and Dynamic Behavior

The lag selection criteria presented in Table 2 indicate an optimal lag length of zero (0), as supported by the Akaike Information Criterion (AIC), Hannan–Quinn Information Criterion (HQIC), Schwarz Bayesian Information Criterion (SBIC), and Final Prediction Error (FPE). Determining the optimal lag length is a critical step in time-series econometric analysis because it ensures that the model adequately captures the dynamic relationships among variables while avoiding over-parameterization and loss of degrees of freedom. An appropriate lag structure enhances the reliability, efficiency, and validity of subsequent cointegration and VECM estimates.

Table 2: Optimal lag length determination

Lag	AIC	HQIC	SBIC
0	3.99514*	4.05049*	4.13723
1	4.02949	4.09867	4.20711
2	4.05995	4.14297	4.2731
3	3.84869	3.94556	4.09737
4	3.79025	3.90095	4.07445*
*indicates lag order selected by the criterion (each test at 5% level)			

Source: STATA 17 (2026)

This choice is supported by the FPE, AIC, HQIC, and SBIC, all of which attain their minimum values at lag 0. While the Likelihood Ratio (LR) test suggests that lag 1 could be considered (P = 0.011), the majority of information criteria favor a more parsimonious specification, which is suitable for this sample (56 observations). This indicates that the first-differenced variables primarily respond contemporaneously, with limited dynamic interactions beyond lag 0.

The preference for lag zero reflects a parsimonious specification suitable for the relatively small sample size (Stock & Watson, 2019). This suggests that adjustments among the variables are largely contemporaneous rather than highly delayed (Hansen & Shin, 2018). This finding is important in the Ugandan context, where macroeconomic adjustments, particularly in consumption and external balances tend to respond quickly to shocks due to import dependence and external financing constraints.

Johansen Cointegration Test

The Johansen trace test indicates strong evidence of cointegration among the variables as shown in Table 3 below.

Table 3: Johansen Cointegration Test Results (Trace Test)

Null Hypothesis (H_0)	Trace Statistic	5% Critical Value
$r = 0$	93.16	47.21
$r \leq 1$	50.31	29.68
$r \leq 2$	26.35	15.41
$r \leq 3$	9.55	3.76

Source: STATA 17 (2026)

Trace statistics for ranks 0 through 3 (93.16, 50.31, 26.35, 9.55) exceed their corresponding 5% critical values, rejecting the null hypothesis of no cointegration up to rank 3 (Johansen, 1988; Enders, 2015). This implies the presence of three cointegrating relationships ($r = 3$), confirming a stable long-run equilibrium among the variables despite short-term fluctuations (Johansen, 1988).

Short-Run Dynamics and Adjustment Mechanism (VECM Results)

The VECM results provide important insights into the short-run behavior of the economy as shown in Table 4 below.

Table 4: VECM Short-Run Coefficients and Error Correction Terms

Dependent	ECT ($_{ce1}$)	P-value	Key Significant Lags	P-Value
$\Delta \ln_TR$	-1.253	0.000	$\Delta \ln_TR(-1)$: 0.216	0.134
$\Delta \ln_PC$	0.056	0.449	$\Delta \ln_PC(-1)$: -0.467	0.000
$\Delta \ln_TI$	-0.074	0.037	$\Delta \ln_TR(-1)$: 0.063, $\Delta \ln_TI(-1)$: -0.376	0.012, 0.004
$\Delta \ln_GGGD$	0.003	0.934	None significant	-

Source: STATA 17 (2026)

The VECM results indicate a rapid adjustment of Uganda's economic variables toward their long-run equilibrium. The error-correction term for total reserves ($\Delta \ln_TR$) is strongly negative (-1.253, $P < 0.001$), suggesting that deviations from the long-run equilibrium are corrected swiftly within a single period. This reflects a fast error-correction process, where short-term shocks, such as changes in private consumption, investment, or government spending, temporarily disturb total reserves but are quickly absorbed as the system returns to its equilibrium path. This finding is consistent with macroeconomic theory, which predicts that reserve levels adjust rapidly to restore balance following external or domestic shocks.

Private consumption ($\Delta \ln_PC$) primarily adjusts through its own lagged change (-0.467, $P < 0.001$), indicating that short-run fluctuations in consumption are largely influenced by prior consumption patterns rather than contemporaneous changes in reserves, investment, or government spending. Total investment ($\Delta \ln_TI$) responds to both lagged total reserves (0.063, $P = 0.012$) and its own lag (-0.376, $P = 0.004$), showing

that investment decisions are partially guided by past reserve levels. Gross government debt ($\Delta \ln_GGGD$), however, exhibits no significant short-run adjustments, suggesting that fiscal activities have weaker immediate interactions with the other variables.

Long – Run Results

The cointegration equation ($_{ce1}$) represents the long-run equilibrium relationships.

Table 5: Long-Run Relationship

Variable	Coefficient	P-value
$\ln_TR$	1	-
$\ln_PC$	-0.844	0.029
$\ln_TI$	1.463	0.084
$\ln_GGGD$	0.286	0.585
Constant	-0.077	-

Source: STATA 17 (2026)

Total reserves are normalized to 1 as the reference variable. Private consumption has a significant negative long-run relationship with total reserves (-0.844, $P = 0.029$), indicating that increases in consumption over time are associated with reductions in reserve levels. This may reflect a structural effect whereby higher domestic spending reduces the accumulation of external reserves or affects the country's balance of payments. Total investment shows a positive coefficient (1.463, $P = 0.084$), though it is marginally insignificant, suggesting that higher investment may support reserve accumulation in the long run, but the effect is not statistically robust. Gross government debt has a positive but non-significant effect (0.286, $P = 0.585$), implying that fiscal outlays exert only a weak or indirect influence on total reserves over time.

The significant error-correction terms confirm that short-run deviations from the long-run equilibrium are systematically corrected, validating the presence of a stable long-term relationship among total reserves, private consumption, investment, and government spending in Uganda.

General Interpretation / Discussion

The long-run results demonstrate that domestic macroeconomic conditions play a significant role in shaping Uganda's international reserve dynamics, consistent with the theoretical perspectives underpinning the study. The significant negative relationship between private consumption and international reserves supports the precautionary motive theory, which emphasizes the importance of maintaining adequate reserves to cushion economies against external vulnerabilities. In Uganda's case, rising consumption, particularly when driven by imported goods and services, increases foreign exchange demand and reduces the capacity to accumulate reserves. This finding is consistent with Mah (2017) and Gabrisch and Holtemöller (2018), who argue that consumption-driven import growth can weaken reserve accumulation in small open and import-dependent economies.

The positive but marginally significant effect of total investment on reserves provides partial support for the mercantilist approach, which suggests that productive investment can enhance reserve accumulation through increased production capacity, export expansion, and foreign exchange generation. However, the weak statistical significance reflects the structural characteristics of developing economies such as Uganda, where investment often relies heavily on imported machinery, equipment, and intermediate inputs, creating short-run foreign exchange pressures before generating export gains. This finding aligns with Obstfeld et al. (2010) and Adegboye et al. (2020), who highlight the dual effect of investment on external balances through both import demand and future productivity gains.

Test for autocorrelation using the Lagrange-Multiplier Test

To assess the presence of serial correlation in the model residuals, the Lagrange Multiplier (LM) test for autocorrelation was conducted (Stock & Watson, 2019). This test is essential in time-series analysis as it helps verify whether the error terms are independently distributed, thereby ensuring the reliability and efficiency of the estimated results (Enders, 2015) as shown in Table 7 below.

Table 7: Lagrange-Multiplier test for autocorrelation

Lag	Prob > chi2
1	0.44394
2	0.10608

Source: STATA 17 (2026).

As highlighted in Table 7, the Lagrange multiplier test shows that the P-values for both lag 1 and 2 are greater than the conventional significance level of 0.05%, indicating no evidence of autocorrelation in the regression residuals, and thus supporting the reliability of the regression.

Contributions of the Study

This study makes three key contributions to the literature. First, it provides country-specific evidence for Uganda, addressing the limitation of previous cross-country studies that fail to capture structural country differences. Second, it integrates private consumption, investment, and government debt within a single dynamic framework, whereas most prior studies focus on external sector variables alone. Third, it applies a VECM approach to jointly capture short-run adjustments and long-run equilibrium relationships in Uganda's external sector, providing richer dynamic insights.

Limitations of the Study

Despite its contributions, the study is limited by potential measurement inconsistencies in historical fiscal data, particularly in earlier years. In addition, the model excludes other relevant external determinants such as exchange rate volatility, remittances, and foreign direct investment, which may also influence reserve dynamics. Future research could extend the model to incorporate these variables and explore nonlinear relationships.

Conclusion

Overall, the results indicate that Uganda's macroeconomic system is characterized by a stable long-run equilibrium between reserves and key domestic variables, with rapid short-run adjustments. The findings emphasize the importance of managing domestic consumption patterns and improving the productivity of investment to support sustainable reserve accumulation.

Recommendations

- Encourage Sustainable Domestic Consumption:**
Policies should promote savings and financial planning to prevent excessive domestic consumption from depleting total reserves, while still supporting economic growth.
- Promote Productive Investment and Export-Oriented Sectors:**
The Government, through the Uganda Free Zones and Export Promotion Authority (UFZEPa) and the Uganda Investment Authority (UIA), should strengthen the promotion of export-oriented investments by providing targeted investment facilitation, attracting foreign and domestic investors into manufacturing and value-addition industries, and supporting firms with market access and trade facilitation services. This will expand Uganda's productive capacity, increase foreign exchange earnings, strengthen international reserve accumulation, and reduce vulnerability to external sector shocks.
- Extend External Sector Growth Theory to Sectoral Analysis:**
The study recommends incorporating sector-specific external sector

Government debt exhibits a positive but statistically insignificant long-run effect on international reserves, providing limited support for the debt vulnerability hypothesis, which predicts that rising debt obligations may constrain reserve accumulation through increased foreign exchange requirements for repayment. The positive coefficient may indicate that borrowed resources have partly supported productive public investments and economic activities that generate foreign exchange over time. However, the insignificant relationship suggests that the impact of debt on reserves depends on the efficiency of debt utilization, fiscal management, and the extent to which borrowed funds contribute to productive capacity. This finding is consistent with Reinhart and Rogoff (2010) and IMF (2023b), which emphasize that the relationship between public debt and external stability is determined by debt sustainability, borrowing purpose, and repayment capacity.

Overall, the findings confirm that Uganda's reserve dynamics are influenced not only by external factors but also by domestic consumption patterns, investment structures, and fiscal conditions. The results extend existing literature by demonstrating that domestic macroeconomic drivers operate through different theoretical channels, highlighting the need for policies that balance consumption growth, productive investment, and prudent debt management to strengthen reserve adequacy and external sector resilience.

Post-Diagnostic Tests

Test for heteroscedasticity using Breusch-Pagan Test

As indicated in Table 6, the Chi-squared test statistic of 0.03 with 1 degree of freedom yielded a P-value of 0.5371, indicating that the null hypothesis of constant variance cannot be rejected.

Table 6: Breusch-Pagan test for heteroscedasticity

Chi2(1)	P-value
0.03	0.5371

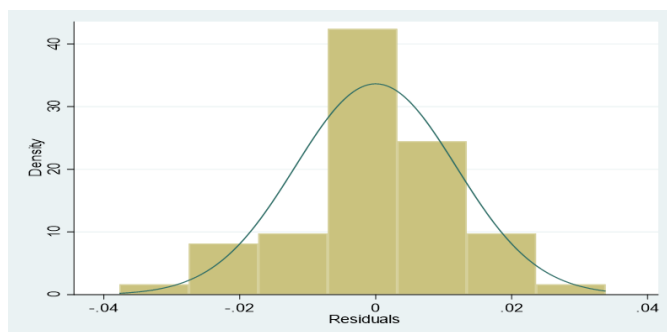
Source: STATA 17 (2026).

This suggests that there is no evidence of heteroscedasticity in the model. Therefore, the assumption of constant variance in the error terms holds, supporting the reliability of the regression results as indicated in Table 6 above.

Normality Test for Residuals

The histogram reveals an approximately symmetric, bell-shaped distribution that closely follows the theoretical normal curve, suggesting no severe deviations from normality as shown in Figure 1 below.

Figure 1: Normality Test for Residuals



Source: STATA 17 (2026).

The results suggest that the model residuals satisfy the normality assumption, which is crucial for the validity of our hypothesis tests and confidence intervals. This finding is particularly important for our policy inferences, as it indicates that our statistical conclusions about the relationships between monetary policy variables and tax revenue performance are not compromised by non-normal error distributions.

linkages into growth theories to better explain how variables such as FDI, remittances, exchange rates, debt servicing, and reserves influence agriculture, industry, and services differently. This extends traditional growth frameworks, which often emphasize aggregate economic performance, by highlighting the role of external sector dynamics in structural transformation.

Areas for Further Inquiry

Future research could incorporate additional external sector variables such as exchange rates, exports, remittances, and foreign direct investment to provide a more comprehensive analysis of reserve dynamics.

Comparative studies across East African countries may also help establish whether the observed relationships are country-specific or regional in nature.

In addition, future work could apply nonlinear or alternative econometric approaches, such as SVAR or NARDL models, to capture possible asymmetric effects and improve robustness of the findings.

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