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Intersecting Dynamics: The Influence of Macroeconomic Factors and Financial Development on Interest Rate Spreads in Uganda

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Abstract: The study investigates the factors influencing interest rate spreads in Uganda's banking sector, focusing on inflation, GDP, Real Effective Exchange Rate (REER), private sector credit, and financial development. Using an Autoregressive Distributed Lag (ARDL) model on data from 2001 to 2022, it examines short and long-term dynamics between these variables and interest rate spreads, within the liquidity preference theory framework. In the short run, inflation and GDP have marginally significant positive impacts on interest rate spreads, indicating that initial increases may widen spreads due to heightened liquidity demand and economic activity. Conversely, in the long run, these factors exhibit significant negative effects, suggesting a stabilizing influence of monetary policy and increased market efficiency. The REER's short-term impact reflects currency value fluctuations affecting risk premium adjustments, which diminish in the long run as markets adapt. The study also explores the interaction between inflation and financial development, represented by private sector credit, on interest rate spreads. Short-term results show a non-significant negative moderation by financial development, while long-term analysis suggests a potential amplification of inflation's effects as the financial sector matures, requiring nuanced financial development policies. Policy recommendations stress the importance of stabilizing inflation and exchange rates to control interest rate spreads in the short term. Long-term strategies include enhancing banking sector efficiency and promoting competitive practices to mitigate the negative effects of economic growth on interest rate spreads.

Keywords: *Macroeconomic factors, financial development, interest rate spreads and Uganda.*

1. Background

Interest rate spreads hold paramount importance within the banking sector, serving as a pivotal metric for evaluating the profitability and stability of financial institutions (Jefferis et al., 2020). These spreads, defined as the variance between the interest rates charged on loans and those paid on deposits, directly influence a bank's net interest income and overall financial performance (Chatziantoniou et al., 2021). Their widening often signifies increased profitability for banks, while narrowing spreads may signal challenges such as heightened credit risk or intensified market competition (de Ferra & Mallucci, 2022). Globally, interest rate spreads exhibit significant variability among nations, influenced by a myriad of factors including economic conditions, monetary policies, regulatory frameworks, and market dynamics (Kwak, 2024). For instance, recent statistics highlight Argentina's remarkable position with the highest interest rate spread globally, boasting an official rate of 133% (Filiz et al., 2022). This exorbitant spread reflects the economic tribulations faced by the nation, including persistent inflation, currency instability, and fiscal imbalances, which have engendered substantial risk premiums within its financial system (Lilian et al., 2022).

Zooming into the African context, Zimbabwe emerges as the African nation with the highest interest rates, following closely behind Argentina in global rankings (Matenda et al., 2022). The banking sector in Zimbabwe grapples with profound challenges stemming from a tumultuous history of economic instability, hyperinflation, and currency devaluation (Matenda et al., 2022). These adversities have contributed to the prevalence of soaring interest rates, with financial institutions imposing significant spreads to offset risks associated with lending (Matenda et al., 2022). Such elevated interest rates not only discourage borrowing but also impede efforts toward economic growth and financial inclusion (Matenda et al., 2022). Conversely, Uganda presents a divergent narrative within the African landscape (Nabende et al., 2020). While interest rates remain comparatively lower than those of Zimbabwe and Argentina, Uganda's banking sector confronts notable hurdles in effectively managing interest rate spreads (Nabende et al., 2020). Despite efforts by the Bank of Uganda to maintain a stable macroeconomic environment, interest rate spreads in the country exhibit volatility.

Influenced by factors such as inflation, GDP growth, exchange rate fluctuations, and credit market dynamics (Nabende et al., 2020). In Uganda, the interaction between macroeconomic factors and financial development plays a pivotal role in shaping interest rate spreads within the banking sector (Nabende et al., 2020). Inflation, as a primary determinant, wields considerable influence on interest rate spreads by impacting the cost of funds and borrowers' repayment capacity (Owusu-Ankamah & Sakyi, 2021). Similarly, fluctuations in GDP growth rates influence banks' lending behaviors and risk-taking tendencies, thereby affecting the spread between lending and deposit rates (Owusu-Ankamah & Sakyi, 2021). The Real Effective Exchange Rate (REER) also assumes a critical role, reflecting the competitiveness of Uganda's exports and imports and influencing banks' pricing decisions (Owusu-Ankamah & Sakyi, 2021). Moreover, private sector credit, serving as a barometer of financial development, moderates the relationship between inflation and interest rate spreads, underscoring the significance of credit market dynamics in shaping borrowing costs (Shrestha, 2022). This paper endeavors to delve into the intricate interplay of these factors and their collective ramifications on interest rate spreads in Uganda's banking sector (Nabende et al., 2020). By furnishing empirical insights and policy implications, this study seeks to enlighten policymakers, regulators, and market participants on strategies to bolster financial stability, enhance credit accessibility, and foster sustainable economic expansion in Uganda (Nabende et al., 2020; Gitiri, 2022).

2. Literature Review

Theoretical Underpinning: The Liquidity Preference Theory, pioneered by John Maynard Keynes, serves as the cornerstone for understanding the interplay between macroeconomic factors, financial development, and interest rate spreads in Uganda. This theory posits that individuals and businesses' preferences for holding liquid assets, driven by transactional, precautionary, and speculative motives, determine the equilibrium interest rate. At its core, the theory suggests that interest rates adjust to achieve a balance between the demand for readily available money and the central bank's control over the money supply. As macroeconomic conditions and the level of financial development fluctuate, they influence these liquidity preferences, which in turn translate into adjustments in lending and deposit rates by banks, ultimately reflected in the interest rate spread. Within this theoretical framework, the study's dependent variable, Interest Rate Spread (SPREAD), directly reflects the level of liquidity preference in the Ugandan economy. Factors such as inflation (INFL) and GDP growth rate influence the demand for money for transactional and precautionary purposes, potentially leading to a wider spread as banks adjust interest rates to maintain profitability in a dynamic economic environment.

Furthermore, the Real Effective Exchange Rate (REER) and External Debt Stock (EXTDEBT) influence external financial stability and competitiveness, impacting liquidity preferences through capital flows and risk assessments, and consequently, the interest rate spread. Additionally, the interaction of inflation with Private Sector Credit (PSC) adds a layer of density to the analysis. This interaction allows the study to explore how financial development might modulate the effects of inflation on liquidity preference and, ultimately, on the interest rate spread. Therefore, the Liquidity Preference Theory offers a robust framework for analyzing the intricate relationship between macroeconomic indicators, the development of the financial sector, and the behavior of the banking sector in Uganda. By examining how changes in economic growth, inflation, external debt, and the availability of credit influence liquidity preferences and the demand for money, this theory aids in unraveling the intricate mechanisms driving interest rate spreads. It highlights the crucial role of banks in mediating these economic forces through their interest rate policies, ultimately shaping the cost of borrowing and influencing the efficiency of financial intermediation in the Ugandan economy.

The Relationship Between Inflation Rates and Interest Rate Spreads: The relationship between inflation rates and interest rate spreads is a subject of substantial scholarly interest and debate within the field of finance and economics (Damane, 2022). Firstly, inflation is widely acknowledged as a critical determinant of interest rate spreads, primarily due to its impact on the cost of funds for financial institutions (Heider et al., 2021; Li et al., 2020). As inflation rises, the purchasing power of money diminishes, prompting lenders to demand higher interest rates to compensate for the erosion of real returns (Galindo & Steiner, 2022). Consequently, banks adjust their lending rates upward to maintain profitability margins, widening the interest rate spread between lending and deposit rates (Galindo & Steiner, 2022; Heider et al., 2021). Empirical research has consistently corroborated this positive relationship between inflation rates and interest rate spreads, emphasizing the role

of inflation expectations in shaping lending behaviors and market dynamics (Hayat et al., 2021; Li et al., 2020). Secondly, the transmission mechanism through which inflation influences interest rate spreads extends beyond direct effects on nominal interest rates (Heider et al., 2021; Li et al., 2020). Inflation exerts indirect effects on interest rate spreads through its impact on borrowers' creditworthiness and default risks (Damane, 2022). Higher inflation rates often coincide with economic uncertainties and income volatility, increasing the likelihood of loan defaults and credit risks for banks (Epor et al., 2023).

As a result, lenders may adopt risk-premium strategies, further widening interest rate spreads to mitigate potential losses (Epor et al., 2023). Thirdly, the duration and persistence of inflationary episodes significantly influence the magnitude of interest rate spreads (Galindo & Steiner, 2022; Heider et al., 2021). Prolonged periods of high inflation breed uncertainty and instability in financial markets, prompting lenders to adopt risk-averse strategies and elevate interest rates to hedge against inflationary pressures (Galindo & Steiner, 2022). Conversely, episodes of moderate and stable inflation tend to exert a dampening effect on interest rate spreads, as market participants exhibit greater confidence in the purchasing power of money and future income streams (Hayat et al., 2021). Fourthly, the institutional and regulatory environment also shapes the relationship between inflation and interest rate spreads (Heider et al., 2021; Li et al., 2020). Central bank policies, such as inflation targeting frameworks, play a crucial role in anchoring inflation expectations and guiding monetary policy actions, thereby influencing interest rate dynamics and spread adjustments (Galindo & Steiner, 2022).

Additionally, the degree of financial market development and competition further modulates the sensitivity of interest rate spreads to inflationary shocks (Galindo & Steiner, 2022). Finally, the interaction between inflation and interest rate spreads underscores the importance of policy responses and regulatory interventions in maintaining financial stability and economic equilibrium (Hayat et al., 2021; Heider et al., 2021). Central banks often employ a mix of monetary policy tools, including interest rate adjustments and open market operations, to manage inflationary pressures and mitigate adverse effects on interest rate spreads (Hayat et al., 2021). Moreover, regulatory measures aimed at enhancing transparency, risk management practices, and market efficiency can mitigate the adverse consequences of inflation volatility on interest rate spreads, promoting a more resilient and competitive banking sector (Heider et al., 2021).

The Effect of GDP on the Banking Sector's Interest Rate Spreads: The effect of Gross Domestic Product (GDP) on the banking sector's interest rate spreads is a topic of significant interest and scholarly inquiry, reflecting the intricate interplay between macroeconomic conditions and financial market dynamics (Chatziantoniou et al., 2021). Firstly, GDP growth serves as a key determinant of interest rate spreads, exerting both direct and indirect effects on banking sector profitability and risk-taking behaviors (Heider, Saidi, & Schepens, 2021). Empirical studies have consistently demonstrated a positive relationship between GDP growth rates and interest rate spreads, highlighting the role of economic expansion in enhancing credit demand and risk appetite among borrowers (Jefferis et al., 2020). As GDP expands, businesses and households exhibit greater demand for credit to finance investment projects, consumption expenditures, and entrepreneurial ventures, thereby driving up loan volumes and revenues for banks (Nabende et al., 2020). Consequently, banks may adjust their lending rates upward to capitalize on growing credit demand, widening interest rate spreads to maximize profitability margins (Owusu-Ankamah & Sakyi, 2021).

Secondly, the composition and structure of GDP growth also influence the distributional effects of interest rate spreads within the banking sector (Shrestha, 2022). Studies have documented variations in interest rate spreads across different sectors of the economy, reflecting disparities in credit risks, market conditions, and regulatory environments (Jefferis et al., 2020). For instance, during periods of rapid industrialization and infrastructure development, banks may allocate a greater share of their lending portfolios to sectors with higher growth prospects, such as manufacturing, construction, and infrastructure projects, leading to differential pricing of credit and interest rate spreads (Jefferis et al., 2020). Moreover, the presence of structural inefficiencies and credit market imperfections can exacerbate disparities in interest rate spreads, hindering financial intermediation and economic efficiency (Nabende et al., 2020). Thirdly, the transmission mechanism through which GDP growth influences interest rate spreads extends beyond direct effects on credit demand to encompass broader macroeconomic factors and policy responses (Shrestha, 2022). Robust GDP growth often coincides with expectations of future inflationary pressures, prompting central banks to adopt preemptive monetary tightening measures to curb inflation risks (Heider et al., 2021).

As central banks raise policy interest rates to anchor inflation expectations, commercial banks adjust their lending rates upward, widening interest rate spreads to reflect higher borrowing costs and inflationary premiums (Owusu-Ankamah & Sakyi, 2021). Conversely, periods of sluggish GDP growth or economic contraction may induce central banks to implement accommodative monetary policies, lowering policy rates and compressing interest rate spreads to stimulate credit growth and economic recovery (Shrestha, 2022). Fourthly, the stability and predictability of GDP growth play a crucial role in shaping interest rate spreads within the banking sector (Shrestha, 2022). Volatility and uncertainty in GDP growth rates can undermine market confidence, exacerbate credit risks, and induce risk aversion among lenders, leading to wider interest rate spreads and tighter credit conditions (Jefferis et al., 2020). Conversely, sustained periods of stable and moderate GDP growth foster a conducive lending environment, enabling banks to calibrate interest rate spreads more efficiently and allocate credit resources to productive investments (Nabende et al., 2020). Finally, the nexus between GDP growth and interest rate spreads underscores the importance of macroeconomic policy coordination and regulatory interventions in promoting financial stability and sustainable economic growth (Owusu-Ankamah & Sakyi, 2021). Central banks and regulatory authorities play a pivotal role in managing systemic risks, enhancing market transparency, and fostering a competitive banking sector conducive to efficient credit intermediation (Heider et al., 2021).

The Effect of the Real Effective Exchange Rate (Reer) on Interest Rate Spread: The effect of the real effective exchange rate (REER) on interest rate spreads is a complex interplay influenced by various economic and financial factors. Firstly, the REER, which measures the relative value of a country's currency against a basket of foreign currencies adjusted for inflation, plays a crucial role in shaping interest rate spreads by influencing the competitiveness of exports and imports (Jefferis et al., 2020). A depreciation of the REER typically enhances export competitiveness by making domestic goods cheaper for foreign buyers, thereby boosting export revenues and foreign exchange inflows. Conversely, an appreciation of the REER may improve import competitiveness by reducing the cost of imported goods, leading to increased consumer purchasing power and import demand. These fluctuations in trade competitiveness can affect interest rate spreads through their impact on economic activity, exchange rate stability, and inflation expectations. Secondly, the relationship between the REER and interest rate spreads is further nuanced by its implications for monetary policy and exchange rate management.

Central banks often intervene in foreign exchange markets to stabilize the REER and prevent excessive currency fluctuations that could disrupt trade flows and inflation dynamics (Hofmann et al., 2021). Such interventions may involve adjustments to policy interest rates or the implementation of currency pegs or bands to anchor the REER within desired ranges. Changes in monetary policy settings and exchange rate regimes can influence interest rate spreads by affecting banks' cost of funds, market expectations, and risk perceptions. Thirdly, the REER's influence on interest rate spreads is mediated by its implications for inflation dynamics and inflation expectations. Exchange rate movements can directly impact import prices, commodity costs, and production inputs, thereby influencing inflationary pressures and central banks' inflation-targeting objectives (Amanda et al., 2023). Persistent deviations of the REER from its equilibrium level may necessitate monetary policy responses to contain inflationary risks, potentially leading to adjustments in policy interest rates and interest rate spreads. Moreover, exchange rate volatility and uncertainty can affect inflation expectations and risk premia, contributing to fluctuations in interest rate spreads as banks adjust lending rates to reflect changing inflationary environments.

Fourthly, the REER's impact on interest rate spreads is contingent upon the degree of exchange rate pass-through to domestic prices and the openness of the economy to international trade and capital flows. In economies with high trade integration and significant exposure to exchange rate fluctuations, changes in the REER are more likely to translate into adjustments in interest rate spreads as banks respond to shifts in trade competitiveness, inflation dynamics, and external imbalances (Rutayisire, 2020). Conversely, in closed or less open economies with limited exchange rate pass-through, the transmission of REER movements to interest rate spreads may be less pronounced, with other domestic factors exerting greater influence on spread dynamics. Finally, the role of the REER in shaping interest rate spreads underscores the importance of exchange rate policy coordination, macroeconomic stability, and financial market development in fostering efficient credit intermediation and sustainable economic growth. Central banks and policymakers must carefully calibrate exchange rate policies, monetary policy settings, and regulatory frameworks to mitigate exchange rate risks,

promote financial stability, and ensure that interest rate spreads remain conducive to investment, borrowing, and economic expansion (Owusu-Ankamah & Sakyi, 2021).

The Relationship Between Private Sector Credit and Interest Rate Spreads: The relationship between private sector credit and interest rate spreads is a fundamental aspect of financial intermediation that significantly influences the functioning of banking sectors worldwide (Akinci & Queralto, 2022; Alper et al., 2020; Heider et al., 2021; Ibenyenwa et al., 2020; Kaas et al., 2020; NWAFOR, 2022; Obeh & Brotoboh, 2021; Schelling & Towbin, 2020). Firstly, private sector credit, which encompasses loans extended to non-governmental entities such as businesses and households, serves as a key driver of interest rate spreads within the banking sector. Empirical studies consistently demonstrate a positive correlation between private-sector credit growth and interest rate spreads, indicating that expansions in credit availability tend to coincide with wider interest rate spreads (Ibenyenwa et al., 2020). This relationship is grounded in the demand-supply dynamics of credit markets, wherein increasing credit demand exerts upward pressure on lending rates, contributing to spread widening as banks seek to maintain profitability margins. Secondly, the composition and quality of private-sector credit portfolios play a crucial role in shaping interest rate spreads (NWAFOR, 2022). Banks' lending decisions are influenced by borrowers' creditworthiness, risk profiles, and collateral assets, which in turn impact the pricing of loans and interest rate spreads.

High-risk borrowers typically face higher borrowing costs and interest rate spreads to compensate lenders for elevated default probabilities and credit risks, while low-risk borrowers may benefit from lower interest rates and narrower spreads. Consequently, variations in the risk composition of private sector credit portfolios can lead to differential pricing of loans and interest rate spreads across borrower categories and industries (Obeh & Brotoboh, 2021). Thirdly, the availability and cost of funding sources for banks also mediate the relationship between private-sector credit and interest rate spreads (Alper et al., 2020). Banks rely on a mix of funding sources, including deposits, interbank borrowing, capital markets, and central bank facilities, to finance their lending activities. Changes in the availability or cost of these funding sources can influence banks' cost of funds and funding strategies, thereby affecting interest rate spreads. For instance, a shortage of deposits or disruptions in interbank funding markets may compel banks to resort to costlier funding alternatives, leading to upward pressure on interest rates and spread widening (Schelling & Towbin, 2020). Conversely, improvements in funding conditions or access to central bank liquidity facilities may alleviate funding constraints and facilitate spread compression.

Fourthly, the role of regulatory frameworks and prudential standards in shaping the relationship between private-sector credit and interest rate spreads cannot be overstated (Heider et al., 2021). Regulatory requirements, such as capital adequacy ratios, liquidity ratios, and loan loss provisioning standards, influence banks' risk-taking behaviors, lending practices, and interest rate pricing strategies. Stringent regulatory standards aimed at enhancing financial stability and risk management practices may induce banks to adopt conservative lending policies, resulting in wider interest rate spreads to account for higher capital and liquidity buffers. Conversely, lax regulatory standards or regulatory forbearance measures may incentivize risk-taking behaviors and lead to compressed interest rate spreads in the pursuit of market share or profitability. Finally, the macroeconomic environment and business cycle dynamics also interact with private sector credit and interest rate spreads (Kaas et al., 2020). Economic expansions typically coincide with rising credit demand, buoyant business sentiment, and heightened risk appetite, contributing to spread narrowing as banks compete for market share. Conversely, economic contractions or recessions may dampen credit demand, increase credit risks, and induce risk aversion among lenders, leading to spread widening as banks tighten lending standards and price loans to reflect higher risks.

The Moderation of the Relationship Between Inflation and Interest Rate Spreads Influenced by Financial Development, As Indicated by Private Sector Credit: The moderation of the relationship between inflation and interest rate spreads influenced by financial development, as indicated by private sector credit, is a crucial aspect of understanding the dynamics of monetary policy transmission and financial stability (Jefferis et al., 2020). Firstly, financial development, reflected in the depth and breadth of private sector credit markets, plays a pivotal role in shaping the sensitivity of interest rate spreads to inflationary pressures (Owusu-Ankamah & Sakyi, 2021). In economies with well-developed credit markets, characterized by efficient allocation of capital, robust risk management practices, and diversified sources of funding, the impact of

inflation on interest rate spreads may be moderated (Jefferis et al., 2020). This moderation arises from the ability of financial institutions to accurately assess and price credit risks, thereby reducing the need to widen spreads excessively in response to inflation-induced uncertainties (Owusu-Ankamah & Sakyi, 2021). Secondly, the role of private sector credit in moderating the inflation-interest rate spread relationship hinges on its influence on borrower behavior and credit market dynamics (Jefferis et al., 2020).

As financial development progresses, borrowers gain increased access to credit, enabling them to better withstand inflationary shocks by adjusting investment and consumption decisions (Owusu-Ankamah & Sakyi, 2021). Moreover, a diverse range of credit products and financing options may emerge, allowing borrowers to hedge against inflation risks and stabilize interest rate spreads through instruments such as inflation-indexed loans or derivatives (Gitiri, 2022). Thirdly, the effectiveness of financial development in moderating the inflation-spread relationship depends on the quality of financial infrastructure, regulatory frameworks, and institutional arrangements (Jefferis et al., 2020). Sound banking supervision, transparent disclosure standards, and legal enforcement mechanisms are essential for maintaining the stability and integrity of credit markets, enhancing confidence among market participants, and mitigating systemic risks that could amplify the inflationary impact on interest rate spreads (Alper et al., 2020). Moreover, the presence of competitive financial institutions and diversified funding sources fosters innovation, product diversification, and risk-sharing mechanisms, contributing to the resilience of credit markets to inflationary shocks (Jefferis et al., 2020).

Fourthly, the interaction between financial development, inflation, and interest rate spreads underscores the importance of coordinated monetary and regulatory policies in promoting financial stability and economic growth (Jefferis et al., 2020). Central banks must carefully calibrate monetary policy tools to balance the objectives of price stability, financial inclusion, and credit market efficiency, taking into account the evolving needs and dynamics of the economy (Chatziantoniou et al., 2021). Regulatory authorities, on the other hand, must ensure that prudential regulations and supervisory frameworks are robust and adaptive to changing market conditions, thereby fostering a sound and resilient financial system (Alper et al., 2020). In conclusion, the moderation of the relationship between inflation and interest rate spreads influenced by financial development, as indicated by private sector credit, is a multifaceted process that involves interactions between market dynamics, regulatory frameworks, and macroeconomic policies (Jefferis et al., 2020). Understanding these dynamics is essential for policymakers, regulators, and market participants to formulate effective strategies for managing inflation risks, promoting financial stability, and fostering sustainable economic development (Akinci & Queralto, 2022).

3. Methodology

Research Design: This study adopts a quantitative research design, employing time series data from Uganda. A secondary data collection strategy is implemented, relying on established and reputable sources to minimize potential bias and ensure data accuracy.

Data Sources and Period: The data for the analysis is derived from a Bank of Uganda and World Bank Open Data covering a period of twenty (22) years from 2000 to 2022. This selection of time is strategic for Uganda given that it is the post-reformation period after the economic recovery efforts in the 1990s.

Data Description: The collected data comprises the following variables:

Interest Rate Spread (SPREAD): Defined as the difference between the lending rate (LR) and the Deposit Rate (DR). The spread between these rates captures the profitability of banks' intermediation activities.

Inflation Rate (INFL): Measured as the annual percentage change in the Gross Domestic Product (GDP) deflator. The GDP deflator is a price index that reflects changes in the overall prices of goods and services produced in Uganda. This variable captures changes in the general price level and potential inflationary pressures within the Ugandan economy**.**

Gross Domestic Product Growth Rate (GDP): Represented by the year-on-year percentage change in real GDP. This variable reflects the economic growth performance of Uganda.

Real Effective Exchange Rate (REER): This variable captures the weighted average exchange rate of the Ugandan Shilling (UGX) relative to a basket of major trading partner currencies, providing insights into the external competitiveness of the Ugandan economy.

External Debt Stock (EXTDEBT): Measured as the total outstanding external debt of Uganda as a percentage of GDP. This variable reflects the nation's external indebtedness and potential vulnerabilities to external shocks.

Private Sector Credit (PSC): Represented by the total domestic credit provided by the banking system to the private sector as a percentage of GDP. This variable serves as a proxy for financial development in Uganda.

Interaction Term (INF_PSC): This term is constructed by multiplying the inflation rate (INFL) and private sector credit (PSC). It captures the moderating effect of financial development (proxied by PSC) on the relationship between inflation and the interest rate spread.

Econometric/Statistical Methods: An **Autoregressive Distributed Lag (ARDL) model** is employed to estimate the dynamic interactions between the aforementioned variables and the interest rate spread in Uganda. The ARDL model is particularly well-suited for this study due to the following reasons: The ARDL model enables researchers to look into how variable relationships change over short and long periods, making it efficient for studies with short observations like the current study with just 22 years. Additionally, its incorporation of an error correction mechanism enhances the analysis by quantifying the rate at which variables converge to their long-term equilibrium following a disturbance. This dual capability allows researchers to dissect the intricate interactions between variables over different time horizons, providing a varied understanding of their relationship.

Model Specification: The ARDL model is specified as follows:

$$\Delta SPREAD_t = \alpha_0 + \beta_1 \Delta INFL_t + \beta_2 \Delta GDP_t + \beta_3 \Delta REER_t + \beta_4 \Delta EXTDEBT_t + \beta_5 \Delta PSC_t + \beta_6 \Delta INF\_PSC_t + \gamma_1 INFL_{t-1} + \gamma_2 GDP_{t-1} + \gamma_3 REER_{t-1} + \gamma_4 EXTDEBT_{t-1} + \gamma_5 PSC_{t-1} + \gamma_6 \Delta INF\_PSC_{t-1} + \gamma_7 SPREAD_{t-1} + ect \quad \text{(i)}$$

Where;

Δ denotes the first-difference operator). **α_0:** Constant term, **β_i (i = 1 to 6):** Short-run coefficients of the explanatory variables. These coefficients capture the immediate impact of changes in the explanatory variables on the change in the interest rate spread. **γ_i (i = 1 to 5):** Long-run coefficients of the explanatory variables. These coefficients estimate the influence of the explanatory variables on the long-run equilibrium level of the interest rate spread. **ε_t:** Error term at time t. This term captures any unexplained variations in the interest rate spread not accounted for by the included variables in the model.

4. Results

Table 1: Summary Statistics of Study Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
SPREAD	23	18.13917	1.689369	15.72606	22.85656
INFL	23	8.495212	17.18646	-3.16956	85.35328
GDP	23	5.906849	2.181862	2.951306	10.78474
REER	23	102.8512	6.674581	92.12749	116.989
EXTDEBT	23	36.73352	19.74794	11.17634	70.75517
Psc	23	8134.807	6887.114	621.7937	21803.3
INF_PSC	23	49596.75	69517.55	-2723.41	341010.5

The summary statistics suggest diverse distributions: SPREAD shows a relatively narrow range with low variability, indicative of a more stable measure. 'INFL' exhibits a high standard deviation relative to its mean, suggesting a right-skewed distribution with periods of extreme inflation. 'GDP' has a moderately low standard deviation, indicating relatively stable economic growth with small year-to-year changes. 'REER' presents

moderate fluctuations, which might imply periodic adjustments in currency valuation or trade conditions. 'EXTDEBT' has a high standard deviation, pointing to significant variation in external debt levels, possibly reflecting economic policy changes or external economic shocks. The 'pSC' and the interaction term 'INF_PSC', display large values with substantial spread and variance, suggesting it captures broad economic trends with potential outliers or periods of extreme values.

Correlations Results

Table 2: Correlation Coefficients between Study Variables

	SPREAD	INFL	GDP	REER	EXTDEBT	psc	INF_PSC
SPREAD	1						
INFL	0.1503	1					
GDP	-0.3336	0.0856	1				
REER	0.1729	0.1691	0.0403	1			
EXTDEBT	-0.2961	-0.2782	-0.2871	0.0284	1		
psc	-0.1386	-0.1723	-0.5050*	-0.5509*	-0.0704	1	
INF_PSC	0.0869	0.8985*	-0.051	-0.0554	-0.3624	0.2291	1

The correlation matrix for Uganda's economic indicators shows a mix of weak to moderate correlations, indicating varying degrees of linear relationships between the variables. Interest rate spread (SPREAD) has only weak associations with most other variables, suggesting it does not move strongly in tandem with inflation, GDP growth, or private sector credit. Inflation (INFL) shows a very strong positive correlation with the interaction term (INF_PSC), as expected, since the interaction term includes inflation, but otherwise has weak to moderately negative correlations with external debt and private sector credit. GDP growth is weakly correlated with most variables, though it has a moderate negative relationship with private-sector credit. The real effective exchange rate (REER) has a moderate negative correlation with private sector credit, indicating some inverse relationship. External debt (EXTDEBT) has weak negative correlations with most variables, implying a slight tendency to move inversely to economic growth and credit availability. Generally, the correlations suggest that these economic variables can be included in the same regression equation without any threat of multicollinearity.

Diagnostic Tests

Heteroscedasticity Test: A heteroskedasticity test, checks for uneven spread of errors in a regression model. Normally, errors should be consistent across the board (homoskedasticity). White's test is useful because it doesn't require any specific assumptions about how the errors might be spread unevenly (heteroskedasticity). This makes it a good general test to see if there's a problem with the way errors are spread. If the test finds an uneven spread, it means the standard errors in the regression might be wrong, which can lead to unreliable results.

Table 3: White's test for Homoskedasticity

Test		chi2 (df)	Prob > chi2
White's test for Homoskedasticity		23.00 (22)	0.4017
Decomposition			
Source	**chi2**	**df**	**p**
Heteroskedasticity	23	22	0.4017
Skewness	1.59	6	0.9533
Kurtosis	2.4	1	0.1212
Total	***26.99***	***29***	***0.5722***

The White test results, with a chi-square statistic of 23.00 and a p-value of 0.4017, indicate no rejection of the null hypothesis of homoskedasticity, showing no statistical evidence of heteroskedasticity in the model. Cameron & Trivedi's decomposition of the test into components for heteroskedasticity, skewness, and kurtosis, with respective p-values of 0.9533 for skewness and 0.1212 for kurtosis, further supports the absence of significant deviations from normal assumptions. These findings suggest that the residuals are homoskedastic and normally distributed, affirming the model's specification and indicating that the ordinary least squares estimates are reliable and unbiased, given other OLS assumptions are met. Thus, the model is well-specified, and its estimates can be considered the best linear unbiased estimators (BLUE).

Serial Correlation Test: Serial correlation refers to the statistical dependence between a variable and lagged versions of itself over successive time periods. It is a prevalent characteristic in time series data, where past observations can hold predictive power for future values. Rigorously testing for the presence of serial correlation is vital. Its existence can invalidate the assumption of independence inherent in conventional statistical models, leading to inefficient estimations and erroneous inferences regarding the temporal dynamics of the data. The study uses the Breucsh-Godfrey test, and the results are as follows.

Table 4: Serial Correlation Test Results

lags(p)	chi2	DF	Prob > chi2
1	0.013	1	0.9104

The Breusch-Godfrey LM test for autocorrelation, with a chi-square statistic of 0.013 and a p-value of 0.9104 for one lag, indicates no evidence of first-order autocorrelation in the model's residuals. This outcome suggests that the residuals are independent across observations, fulfilling a crucial assumption for the validity of regression analysis. Consequently, this independence confirms the efficiency of the OLS estimators, ensuring that standard errors and test statistics used in hypothesis testing are reliable. Thus, the model meets important criteria for producing valid and reliable statistical inferences.

Normality Test for Residuals: A crucial aspect of time series analysis involves rigorously testing the normality of residuals. This evaluation ensures that the error terms in a model, often from regression analysis, adhere to a normal distribution. This assumption is vital because many statistical tests and confidence intervals rely on it, which in turn guarantees desirable properties like efficiency and unbiasedness in estimators. Examining normality safeguards the reliability of subsequent inferences. In time series data, non-normal residuals can signal model misspecifications, hidden nonlinearities, or influential factors, potentially weakening the model's predictive power. The Shapiro-Wilk test, known for its sensitivity to even slight deviations from normality in smaller datasets, is a strong choice for this purpose. It compares the observed residuals to a theoretical normal distribution, acting as a stringent check on the normality assumptions for time series residuals.

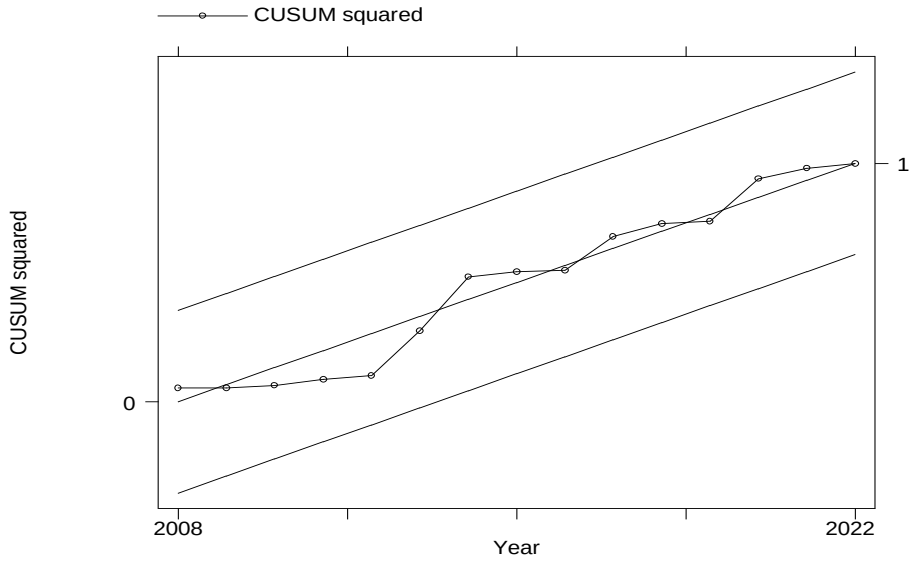
Table 5: Shapiro-Wilk (SW) Test Results

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
residuals	23	0.4724	0.2424	2.08	0.3526

The Shapiro-Wilk test, yielding a p-value of 0.3526, indicates that the null hypothesis of normality cannot be rejected for the distribution of residuals. This assertion is corroborated by the non-significant p-values obtained for tests of skewness (0.4724) and kurtosis (0.2424), further reinforcing the presumption of normality. Such findings suggest that the deviation from a normal distribution is not statistically significant. Consequently, the assumption of normality, which is imperative for the integrity of statistical inferences within the framework of regression analysis, seems to be satisfied. The lack of significant skewness and kurtosis lends additional credibility to the proposition that the residuals approximate a normal distribution, thereby substantiating the methodological soundness of the econometric model employed.

Model Stability Test: A model stability test plays a critical role in ensuring the model's relevance over time. These tests check if the relationships between variables captured by the model remain consistent as new data gets added. A stable model suggests the underlying process generating the data is constant, while instability might indicate changes in the relationships. This is crucial because reliable inferences depend on stable model

parameters. If a model is unstable, its estimated parameters may not reflect the entire data, leading to unreliable predictions and conclusions. The CUSUM of Squares graph is a powerful tool for detecting such instability. This technique can pinpoint specific time periods where the model's variance deviates from expectations, potentially indicating shifts in the data-generating process. This way, the CUSUM graph helps monitor model stability and ensure its ongoing validity.



The Cumulative Sum of Squares (CUSUM of squares) graph, utilized for assessing the stability of regression model coefficients over time, displays data from 2008 to 2022. Observations focus on the CUSUM line's behavior in relation to the boundary lines: stability is inferred if the CUSUM line remains within these boundaries while crossing them suggesting structural breaks. In this case, the CUSUM line consistently stays within the boundaries throughout the observed period, indicating the regression coefficients' stability without evidence of structural breaks, despite nearing the upper boundary at times, which suggests minor variations but no significant structural changes.

Cointegration Investigation: A cointegration test is a statistical procedure utilized to determine the presence of a stable, long-run equilibrium relationship between two or more non-stationary time series variables. Typically required when dealing with integrated series, cointegration testing ascertains whether individual time series variables, which may individually trend over time, move together consistently, thereby implying a meaningful association that is not spurious. The necessity of such testing lies in its ability to inform the appropriate modeling strategy for time series analysis, ensuring that inferred relationships reflect a genuine nexus rather than a coincidental correlation. The Autoregressive Distributed Lag (ARDL) bounds test stands out in this context for its flexibility, allowing for the inclusion of variables of different integration orders, I(0) or I(1), without the need for pre-testing for unit roots. This characteristic of the ARDL bounds test, coupled with its applicability irrespective of the sample size, renders it a robust alternative to traditional cointegration tests, making it particularly suitable for empirical analyses where the underlying data-generating processes are complex and sample sizes are limited.

Table 6: Bounds Test Results

Test	**F-Statistic**	**t-Statistic**		
Observed Value	3.7	-3.395		
Critical Values (0.1 - 0.01), **F-statistic**, Case 3				
Significance (%)	**I(0) Lower Bound**	**I(0) Upper Bound**	**I(1) Lower Bound**	**I(1) Upper Bound**
10	2.45	3.15	3.61	4.43
5	**2.75**	**3.99**	**3.15**	**4.43**
2.5	3.17	4.15	3.41	5.01

1	3.37	4.43	3.64	5.49
Critical Values (0.1 - 0.01), **t-statistic**, Case 3				
Significance (%)	**I(0) Lower Bound**	**I(0) Upper Bound**	**I(1) Lower Bound**	**I(1) Upper Bound**
10	-2.86	-3.43	-4.38	-4.99
5	**-3.13**	**-3.73**	**-4.66**	**-5.34**
2.5	-3.37	-3.97	-4.9	-5.61
1	-3.58	-4.21	-5.15	-5.89

Pesaran/Shin/Smith (2001) ARDL Bounds Test, H0: no levels relationship.

The cointegration results are interpreted at the 5% significance level. The table provides critical values for the F-statistic and t-statistic at different confidence levels. The study compares the absolute values of these statistics with the critical values for integrated variables of order 1 (I(1)). If the absolute value is greater than the critical value (for F-statistic) or less than the critical value (for t-statistic), we can reject the null hypothesis of no cointegration. In this case, neither the F-statistic nor the t-statistic reaches the 5% significance level to reject the null hypothesis. Therefore, based on this test at a 5% significance level, we don't have enough evidence to conclude that the variables are cointegrated. Despite the absence of cointegration evidence at the 5% significance level, a continuation of model estimation using the Autoregressive Distributed Lag (ARDL) approach remains justifiable. This decision is underpinned by the ARDL model's robustness in environments where variables are integrated of order 0, I(0), or order 1, I(1), and do not necessarily need to be integrated. The ARDL framework can estimate both short-term and long-term dynamics simultaneously, providing valuable insights even when cointegration is not established. Furthermore, the limited sample size may have constrained the power of the cointegration test, potentially obscuring the true underlying relationships among the variables. Given that the theoretical underpinnings suggest an expectation of a relationship, and ARDL is known for its flexibility and efficacy with small samples, it is pragmatic to proceed with the estimation process. This will allow for a more nuanced exploration of the variables' interplay, capturing any latent associations that the preliminary cointegration tests may not have detected.

ARDL Regression Results: The study proceeded with estimating an ARDL model with one lag for all variables. This choice aligns with the Bounds testing approach and is backed by several methodological considerations. The one-lag ARDL model excels at capturing both the short-run dynamics through its focus on immediate past influences and the potential long-term equilibrium relationship between the variables. This approach offers a comprehensive analysis of temporal interactions. Additionally, using just one lag keeps the model parsimonious, which is particularly important when dealing with limited data as it avoids consuming unnecessary degrees of freedom. The uniform lag structure further simplifies the model, making it easier to compare how different variables influence the dependent variable and reducing the risk of overfitting the data. In essence, the one-lag ARDL model offers a well-balanced approach, navigating the complexities of time series data with methodological rigor and analytical clarity. The results are presented as follows.

Short Run

Table 7: Short Run ARDL Results

SR	Coef.	S.E	t-Statistic	p-Value	95% CI Lower	95% CI Upper
Inflation	0.256199	0.113121	2.26	0.053	-0.00466	0.517056
GDP	0.590295	0.293033	2.01	0.079	-0.08544	1.26603
REER	0.265593	0.094504	2.81	0.023	-0.04767	0.48352
External Debt	0.072996	0.043897	1.66	0.135	-0.02823	0.174223
Private Sector Credit	0.001927	0.001186	1.63	0.143	-0.00081	0.004661
INF_PSC.	-0.0006	3.06E-05	-1.96	0.086	-0.00013	-1.1E-05
Constant	49.91061	14.59392	3.42	0.009	16.25698	83.56425

The short-run ARDL model findings illustrate a nuanced dynamic between inflation, GDP growth, and other variables with the interest rate spread, contrasting with long-run observations. Specifically, both inflation and GDP growth are associated with an increase in the interest rate spread in the short run, a reversal from their long-run negative relationship. The Real Effective Exchange Rate positively impacts the spread significantly in the short run, diverging from its long-run influence. While external debt's positive impact and private sector credit's negative impact on the spread are not statistically significant in the short run, they align with the long-run trends. Interestingly, the interaction term between inflation and private sector credit, which positively affects the spread in the long run, shows a negative and insignificant short-run effect. These variances between short-run and long-run effects underscore the complex and dynamic nature of economic relationships, indicating that immediate responses to inflation and GDP growth differ from their longer-term adjustments.

Long Run

Table 8: Long Run ARDL Results

Variable	Coefficient	Std. Error	t-Statistic	P-value	95% CI Lower	95% CI Upper
SPREAD $_{L1}$	-1.2171	0.3744	-3.4	0.009	-2.1344	-0.4773
INFL	-2.7677	0.1402	-2.66	0.029	-5.1694	-0.3659
GDP	-1.1316	0.24	-4.72	0.002	-1.685	-0.5783
REER	-0.0966	0.0505	-1.91	0.092	-0.213	0.0199
EXTBDEBT	-0.0274	0.0814	-1.51	0.169	-0.0693	0.1441
psc	-0.0007	0.0002	-4.05	0.004	-0.0011	-0.0003
INF_PSC	0.0001	0.00003	2.48	0.038	0.00001	0.0001
Sample Period	2001 - 2022					
Number of obs	22					
R-squared	0.8471					
Adjusted R-squared	0.5987					
Root MSE	1.045					
Log-likelihood	-21.0572					
Lag structure	ARDL (1,1,1,1,1,1,1)					

The ARDL regression analysis, covering 2001 to 2022, reveals a strong relationship between the interest rate spread and various explanatory variables, with the model explaining approximately 84.71% of the variance in the interest rate spread. A notable finding is the negative and significant relationship between the lagged interest rate spread and the current spread, suggesting that a higher previous period's spread leads to a lower current period spread. Additionally, both inflation and GDP growth negatively impact the interest rate spread, indicating that higher rates of inflation and GDP growth correlate with lower spreads. While the real effective exchange rate and external debt show negative coefficients, these are not statistically significant, hinting at a weaker influence on the spread. Conversely, an increase in private-sector credit is associated with a decrease in the interest rate spread, and interestingly, the interaction between inflation and private-sector credit positively affects the spread.

5. Discussion and Conclusion

The relationship between inflation rates and interest rate spreads in Uganda in the short run is positive and marginally significant (p=0.053), suggesting that a unit increase in the inflation rate increases the interest rate spread by 0.2561, albeit with a marginal significance that is slightly above the conventional threshold of 0.05. This aligns with the liquidity preference theory, where lenders demand higher interest rates as compensation for expected inflation. Long-run effects are negative and significant (p=0.029), indicating that in the longer term, high inflation may dampen the interest rate spread by 2.7677. This could be due to the central bank's monetary policy reacting to inflation, impacting on long-term lending rates. The slight discrepancy between

the short-run and long-run effects highlights the complexities of monetary policy and inflation dynamics in Uganda. The Central Bank of Uganda might need to manage inflation proactively to maintain stable interest rate spreads.

GDP has a significant short-run positive effect on the interest rate spreads (p=0.079), with a coefficient of 0.5903 indicating that economic growth is associated with wider spreads. This could be because, as the economy grows, demand for credit increases, allowing banks to charge higher spreads.

However, in the long run, the effect is negative and highly significant (p=0.002), with a coefficient of -1.1316. As the economy matures, increased competition and efficiency in the banking sector might drive spreads down. As the Ugandan economy grows, efforts to enhance competition and efficiency in the banking sector could be beneficial in reducing interest rate spreads in the long run. The short-run effect of the real effective exchange rate (REER) on interest rate spread is significantly positive (p=0.023), which could be due to foreign exchange risk premiums. When the local currency depreciates, lenders may require higher spreads to compensate for the increased risk. The long-run effect, however, is negative but not significant (p=0.092), suggesting that over time, as the exchange rate stabilizes or if the market adjusts to the volatility, the effect on interest rate spreads diminishes. The Bank of Uganda could focus on stabilizing the exchange rate to manage the short-term effects on interest rate spreads, whereas in the long term, market adjustments are likely to mitigate these effects. The relationship between private sector credit and interest rate spreads is positive in the short run (p=0.143) but not significant.

This suggests that an increase in private sector credit is associated with a small increase in interest rate spreads, though the effect is not statistically robust. The lack of significance could indicate other overriding factors in the determination of spreads. While the private sector credit's influence on interest rate spreads is not clear-cut, encouraging responsible lending and borrowing practices could stabilize the impact on spreads. Financial development represented by private sector credit seems to moderate the relationship between inflation and interest rate spreads. In the short run, the interaction term between inflation and private sector credit (INF_PSC) has a negative coefficient, suggesting that increased financial development may reduce the positive impact of inflation on interest rate spreads. However, this effect is not significant in the short run (p=0.086) but is positive and significant in the long run (p=0.038). This indicates that over time, financial development may actually accentuate the effect of inflation on spreads, possibly by increasing the responsiveness of the banking sector to inflationary pressures. Strengthening the financial sector in Uganda could potentially magnify the effects of inflation on interest rate spreads, so a balanced approach to financial development is necessary.

Recommendations: Based on these findings, it is recommended that the Central Bank of Uganda and policymakers focus on stabilizing inflation and exchange rates to manage interest rate spreads in the short term. In the long term, policies to enhance the efficiency and competitiveness of the banking sector can help in reducing spreads as the economy grows. Furthermore, a cautious approach to financial development should be taken to ensure it does not adversely impact on the banking sector's stability.

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