STABILITY OF MONEY DEMAND IN SUB-SAHARAN AFRICA: A CROSS-SECTIONAL ARDL ANALYSIS BY INCOME LEVELS

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Abstract: This study investigates money demand stability in sub-Saharan African (SSA) countries, utilizing a quarterly dataset spanning a 24 year-period from 1999 to 2023 sourced

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from the World Bank Indicators and International Monetary Fund. The study disaggregates SSA countries into three income groups, upper-middle, lower-middle, and low-income, to evaluate the magnitude of stability of money demand, both at the panel level and within each income group. This approach provided nuanced insights and robust policy recommendations. The short- and long-term effects of key predictors on real monetary aggregates were assessed by employing cash-in-advance theory and the cross-sectional augmented autoregressive distributed lag (ARDL) model. The findings reveal that real exchange rates, foreign interest rates, and real GDP significantly influence money demand at the panel level, whereas the inflation rate exerts a contractionary effect. At the income group level, the findings reveal that money demand is stable in upper-middle- and low-income SSA countries, whereas lower-middle-income countries display variability, indicating a divergence in levels of economic resilience across income categories. The study's findings highlight several policy implications and recommendations, as such the study advocates for the adoption of a unified monetary policies framework and a single currency policy, to enhance stability, foster growth, and reduce systemic asymmetries within the region. Additionally, the implementation of inflation-targeting policies is recommended to further consolidate economic stability and promote sustainable development across SSA countries.

Keywords: Money demand; monetary stability; sub-Saharan Africa; real monetary aggregate; foreign interest rate; inflation targeting.

JEL Codes: E41; E31, E52, O55, E43, F34, E31, E52.

1. Introduction

In the 21st century, the convergence of economic globalization and evolving monetary policy frameworks has made the understanding of money demand stability in Sub-Saharan Africa (SSA) a critical issue for scholars and policymakers alike. According to Friedman (1988), proponents of the quantity theory of money demand posit that stability in money demand is a function of stability in income, price level, relative rates of return, and money demand. The multifaceted developmental landscape of SSA countries characterized by economic uncertainties dampens both domestic and foreign investment. The instability in money demand and exchange rates further complicates the formulation of effective monetary policies, management of balance of payments, mitigation of external debt burdens in the region, and high inflation rates eroding purchasing power, elevating living costs, and also contributing effectively to social unrest within the region (Adil et al., 2018; Samuel et al., 2019b; Samuel et al., 2019a). The stability of money demand is a fundamental prerequisite for adopting monetary targeting. In SSA, the stability of the regional economy hinges on a targeted and effective monetary policy framework, where monetary aggregates, such as M2, serve as pivotal tools for controlling inflation. Understanding the stability of money demand is particularly vital in SSA, where a region's sensitivity to inflation and exchange rate fluctuations is integral to

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understanding the money demand stability and inflation nexus (Albulescu & Pepin, 2018).

Adil, Hatekar, and Sahoo (2020) and Samuel et al. (2019a) highlight the relevance of money demand stability as a potent monetary policy instrument in the contemporary global economic landscape, characterized by shifting economic structures and money demand function instability. To assess the ripple effects of these structural changes, Chaisrisawatsuk et al. (2004) employed a cointegration analysis to estimate the dynamics of classical money demand functions. The significant vulnerabilities in financial practices, regulatory frameworks, and broader economic imbalances exposed during the 2007-2008 global recession, coupled with the SSA economy's inability to absorb the economic uncertainties triggered by the COVID-19 pandemic, have prompted a renewed focus on money and liquidity in monetary policies (Narayan, 2010; Samuel et al., 2019b). In response to financial and economic imbalances and those exacerbated by the COVID-19 pandemic, Poole (1970) recommends focusing on interest rates as a targeted monetary policy interest to boost liquidity and ensure financial stability (Poole 1970). Following this recommendation, the South African Reserve Bank reduced its repo rate by 300 basis points, the Central Bank of Nigeria lowered its benchmark interest rate, and the Central Bank of Kenya reduced its Cash Reserve Ratio (CRR). Similarly, the Bank of Ghana reduced the primary reserve requirement to enhance liquidity in the banking sector by introducing regulatory measures such as loan moratoriums and forbearance policies (Udoh et al 2023b). Instability in money demand implies an unbalanced money multiplier effect, thereby thwarting effective monetary policy implementation.

The objective of this study is to evaluate the stability of money demand from 1999-2023 in SSA, with a specific focus on income-level distinctions. The focus on SSA countries is particularly compelling, given the significant monetary policy framework evolution in this region triggered by economic, social, and institutional transformations. Building on the sensitivity of the money demand function and its implications for monetary policy in developing economies, as emphasized by Drakos and Kouretas (2015), Asongu et al. (2020), and others. Most empirical studies on money demand stability predominantly focus on developed economies, such as Miller et al. (2019) in the US, Karaman et al. (2020), Mera et al. (2020), and Barnett et al. (2021), leaving a significant gap in the understanding of this phenomenon in SSA. Factors such as data inconsistency, large informal sectors, rapid structural changes, underdeveloped financial systems, economic and political instability, and the prevalence of foreign currencies in domestic transactions complicate the measurement and analysis of money demand in SSA.

Previous studies often aggregate SSA countries, overlooking the diverse impacts of

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money demand stability across different income levels, leading to heterogeneous results. This study contributes uniquely to the literature by focusing on SSA countries, given their significant regional economic and structural changes. The study period covers all monetary policy regimes and financial system restructuring in SSA. The theoretical framework of this study is cash-in-advance theory, which provides a robust basis for understanding money demand by explicitly accounting for the role of money in facilitating economic transactions and identifying key predictors such as income levels, interest rates, and inflation. This theoretical underpinning supports the analysis of money-demand stability, which is essential for effective monetary policy formulation. The study's specific objectives include: (1) assessing the log-run nexus between money demand and its predictors of real income, real exchange rate, foreign interest rate, and inflation rate in SSA; (2) examining the variability of money-demand stability across diverse income levels in SSA and its implications for potential monetary integration in the region; and (3) evaluating the policy implications of future patterns in money demand stability for liquidity management and economic stability in SSA economies in SSA economies. This study contributes to the literature by adopting (M2) as a monetary aggregate to assess both short- and long-term influences on real income (RGDP), foreign interest rate (FINR), real exchange rate (REC), and inflation rate (INF). The analysis focuses on M2 as the standard aggregate measure of money demand. This study employs a novel methodological approach, diverging from predominantly regression-based analyses that focus on the short-term nexus and often neglect longitudinal perspectives. Gunst and Mason (1980) argue that inferences drawn from a single model are statistically questionable. Thus, adopting a diverse paradigm to investigate money demand stability will provide crucial insights for policy formulation in the SSA region (Grassa & Gazdar 2014; Udo et al., 2023). By utilizing the Cross-Sectional Augmented Autoregressive Distributed Lag (CS-ARDL) model, the study examines both short - and long-term links, accounting for cross-sectional dependence, which is essential when dealing with panel data encompassing multiple countries. This model allows for the simultaneous estimation of the short- and long-run influences of economic variables, offering a comprehensive understanding of money demand behavior across diverse income brackets. By disaggregating the analysis by income level: lower-middle income (LM), upper-middle income (UMI), and low income (LI), this study provides granular insights into how economic variables affect money demand differently across various income categories. Moreover, the study dataset spans from 1999 to 2023, capturing long-term trends and cyclical patterns that previous studies with shorter datasets ignored.

By utilizing the cash-in-advance conceptual framework, which acknowledges the open market operations and socioeconomic interdependencies of these economies, this study ensures robust model stability through Hansen's (1992) test. The study

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findings not only enhance our understanding of money demand dynamics in SSA but also offer valuable policy implications for fostering economic stability and growth in the region. It addresses critical lacunae in the literature and provides robust empirical evidence using advanced econometric techniques, making it highly relevant for policymakers aiming to enhance economic resilience and support sustainable development in SSA. The study is systematized as follows. First, we present a literature review and theoretical review. The next section presents an empirical review, followed by the methodology, model explanation, variables, and data collection. The following section discusses the findings, conclusions, theoretical contributions, practical implementation, and recommendations for future research.

2. Literature review
2.1. Theoretical literature
The money demand function reflects the aggregate influence of various macroeconomic predictors on money demand, with real income and price levels playing a central role (Hueng, 1998). The extant literature reveals that empirical analyses of money demand are typically conducted under the assumption that money demand functions as a scale variable and a vector of opportunity costs. This assumption is grounded in the understanding that the demand for real money is driven by speculative and transaction motives. Consequently, long-run money demand can be fundamentally expressed as:

$$\frac{M}{P} = f\ (Y; OP; Z) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . . \ldots . (1)$$

where $\frac{M}{P}$ =real money demand as a function of Y = income, opportunity cost (OP) and other explanatory variables (Z). Economic theory reveals that income should positively influence money holdings, as a 1% change in income level increases demand for money. Conversely, opportunity cost variables, which represent potential earnings from alternative assets, are expected to have a negative influence on money demand. Studies assessing money demand functions in SSA countries, considering significant institutional and economic changes, report diverse and sometimes conflicting results. Money demand stability indicates that money supply effectively explains inflation and economic performance metrics, thus providing a foundation for monetary policy development.

Keynes (1936) analyzed the money demand function and (developed the liquidity preference theory to explain why economic agents hold money for transactions and precautionary and speculative motives. Keynes emphasized that individuals hold money to bridge the gaps between receipts and payments and for precautionary purposes. According to Keynes, both transaction and precautionary motives for

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holding money are functions of income (Nchor and Adamec, 2016). Studies by Adekunle (1968) and Sowa (1993) support this notion while also recognizing income as a determinant of money demand. Baumol (1952) and Tobin (1956), expanding Keynes' theory, highlighted the critical role of interest rates as the opportunity cost of holding money, influencing all three motives. Specifically, a 1% increase in interest rates raises the cost of holding money, which, in turn, reduces the number of individuals, households, and businesses that are willing to hold (Nchor & Adamec, 2016).

Khan and Ahmed (2016) and Samuel et al (2019d) posit that, in pursuit of economic growth and price stability, economic policies must ensure the stability of exchange reserves to mitigate fiscal distractions. In a dynamic environment, the stability of money demand is contingent upon capturing the effects of capital mobility and currency substitution as instruments of monetary policy (Nepal & Paija, 2020). Capital mobility significantly impacts monetary policy through exchange rates and interest rate integration into the conventional money-demand function to support capital mobility and currency substitution in an open economy (Chowdhury, 1995). Understanding economic agents' direct and indirect motives for holding money is crucial for monetary authorities. The quantity theory of money posits that the money demand function exogenously influences the supply of money, thereby impacting the inflation rate and economic growth. Linearity in the money supply is a function of production, inflation, and the velocity of money, which is presumed to be stable. Therefore, evaluating the stability of velocity is equivalent to evaluating the stability of money demand, according to (Albulescu & Pepin, 2018; Samuel et al 2019a).

2.2. Empirical literature
2.2.1. Country-Specific Analyses
In assessing the magnitude of money demand stability across various countries and regions, Wang (2011) in the US considering regime shifts, observed that the semi-elasticity of the interest rate sharply increased between 1932–1952. Zuo and Park (2011) analyzed China's money demand from 1996 to 2009 using the smooth time-varying cointegration technique and observed that stability in the money demand function is triggered by the significant role of asset prices. In Tunisia, Ben-Salha and Jaidi (2014) identified a long-run link between broad money demand and its determinants from 1979 to 2011 using the autoregressive distributed lag (ARDL) model. Their findings indicated that the interest rate affected money demand in the short run, whereas, in the long run, final consumption expenditure and interest rates were the primary determinants.

In the Philippines, Hafer and Kutan (2003) observed that the monetary aggregate is an effective instrument for controlling monetary policy despite financial innovation. Using the ARDL model, Nair et al. (2008) observed a significant long-run nexus

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between money demand and its determinants from 1970 to 2004. Dogru and Recepoglu (2013) report a positive link between real money demand and real income, with a negative nexus to nominal interest rates. In Italy, the stability in M1 money demand according to Daniele et al. (2017) can be attributed to the inclusion of exchange rate volatility in the model. Using Nigeria Folarin and Asongu (2019) observed that interest rates were not always effective in stabilizing money demand. Adil, Haider, and Hatekar (2020) explored the asymmetric effects of exchange rate movements on money demand in India's open economy.

2.2.2. Panel Analyses

Chaisrisawatsuk et al. (2004) studied Asian countries from 1980 to 1996 using the portfolio balance model and observed that effective monetary policies check currency substitution effects. Hamori and Hamori (2008) observed stability in M1, M2, and M3 in Eurozone economies from 1999 to 2006. In Central and Eastern European Countries (CEEEs), Mera et al. (2020) reported the traditional money demand function as a significant determinant, while economic sentiments captured through ESI (European Sentiment Indicators) explain the money demand function more precisely, reporting the roles of euro and dollar substitution.

Karaman et al. (2020), in the European Union, attributed monetary stability to political factors and fiscal capacity. In the South Asian Association for Regional Cooperation (SAARC) countries, Nepal and Paija (2020) from 1986-2017 observed money demand stability effects on money supply as a rational policy instrument controlling monetary policies in the SAARC region. Insight from the empirical literature reveals that despite the significant extant literature on the stability of money demand, studies in SSA countries are limited. This gap in the literature provides ample room for this study to contribute to the extant literature on money demand stability by exploring the dynamic and complex nature of the money demand function in SSA, focusing on the role of key macroeconomic variables. To provide a comprehensive understanding of how monetary policies can be optimized in this region. A summary of the empirical and theoretical reviews is presented in Tables 1 and 2.

Table 1. Empirical Reviews

Author(s)	Country	Methodology	Key Findings
Wang (2011)	US	Money demand functions with regime shifts	Semi-elasticity of interest rate increased sharply, indicating variable sensitivity during significant economic changes.

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Zuo et al. (2011)	China	Smooth time-varying model	Stability in money demand due to the role of asset prices in a rapidly growing economy.
Folarin and Asongu (2019)	Various	ARDL model	Interest rates are not always effective for money demand stability; other factors are also important.
Adil et al. (2020)	India	Asymmetric influence analysis	Complex interactions between exchange rates and money demand in an open economy.
Chaisrisawatsuk et al. (2004)	Asian countries	Portfolio balance model	Effective monetary policies can mitigate currency substitution effects.
Mera et al. (2020)	Central and Eastern European Countries	Traditional money demand function and economic sentiments	Money demand is influenced by economic sentiments, especially with euro and dollar substitution.
Karaman et al. (2020)	European Union	Analysis of political and fiscal factors	Monetary stability is attributed to political factors and fiscal capacity.
Nepal and Paija (2020)	SAARC countries	Rational policy instrument analysis	Significant influence of money supply on controlling monetary policies; the importance of regional policy coordination.
Income and Interest Rate Elasticity in Africa			
Nchor and Adamec (2016)	Ghana (M1; 1990-2014)	ARDL model	Stable
Kapingura (2014)	South Africa (M3; 1995Q1-2012Q4)	Johansen maximum	Not stable
Kumar et al. (2013)	Nigeria (M1; 1960-2008)	ARDL model	Stable
Akinlo, (2006)	Nigeria (M2; 1970Q1-2004Q4)	Johansen maximum	

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| Herve and Shen, (2011) | Côte d'ivoire (M1; 1980-2007) | Johansen maximum | Not stable |

Source: compiled by the authors (2024)

Table 2. Summary of Theoretical Reviews

Concept	Description	Key References
Money Demand Function	Captures the influence of several macroeconomic predictors on money demand, anchored in real income and price levels. Stability indicates effective monetary policy and mitigates fiscal distractions.	Hueng (1998); Khan & Ahmed (2016); Samuel et al. (2019d)
Capital Mobility and Currency Substitution	Money demand stability is influenced by capital mobility and currency substitution, which are key instruments of monetary policy, particularly through the mechanisms of exchange rates and interest rates.	Nepal & Paija (2020); Chowdhury (1995)
Influence of Capital Mobility	Capital mobility impacts monetary policy by integrating exchange rates and interest rates, supporting an open economy.	Chowdhury (1995)
Economic Agents' Motives	Understanding motives for holding money is crucial for monetary authorities. Direct and indirect motives affect money demand.	-
Quantity Theory of Money	Posit that money demand exogenously influences money supply, impacting the inflation rate and economic growth.	-
Stability of Velocity of Money	Equivalent to evaluating money demand stability.	Samuel et al. (2019a)
This table succinctly captures the main points related to the money demand function, capital mobility, currency substitution, and their implications for monetary policy.		

Source: compiled by the authors (2024)

Despite the extensive literature on the money demand function across various developed and developing countries, a significant gap remains in the context of SSA. Most previous studies have focused on individual countries or regions such as the United States, China, Tunisia, Turkey, Italy, India, Asian countries, Central and Eastern European countries, and the SAARC region. While these studies provide valuable insights into the economic conditions and policy impacts within these nations, they largely overlook SSA, a region with distinct economic challenges and policy environment. The scarcity of empirical studies on SSA countries means that regional policymakers lack tailored insights into how various macroeconomic

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variables influence money demand. This gap is particularly significant given the economic diversity and varying income levels across SSA countries.

Understanding these dynamics is crucial for several reasons; a) SSA countries exhibit significant heterogeneity in terms of income levels, economic structure, and political stability. This diversity necessitates a nuanced analysis to differentiate how economic variables affect money demand across diverse income brackets; and b) effective monetary policy hinges on a deep understanding of the stability and determinants of money demand. Without region-specific studies, it is challenging for SSA policymakers to design and implement effective monetary policies that stabilize prices, control inflation, and promote economic growth; c) the high levels of economic and political volatility in SSA, impacting the money demand function, make it crucial to employ models capable of detecting and accounting for structural breaks and dynamic shifts in the economic environment; d) SSA is characterized by unique economic conditions and policy challenges such as a large informal sector, exchange rate and inflation volatility, and political instability, which underscores the need for dedicated study in the region.

3. Methodology

We adopted a comprehensive methodological framework to assess the stability of money demand in SSA from 1999 to 2023. The methodology consists of several key steps: first, nature and data source, a unit root test was conducted using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to confirm the stationarity properties of the series. The cointegration test, particularly the Westerlund approach, was employed to determine the long-run link between variables. The Cross-Sectional Autoregressive Distributed Lag (CS-ARDL) model was used to account for cross-sectional dependence and heterogeneous country-specific effects. The robustness tests, including the Hansen test for structural breaks, are conducted to confirm the stability and reliability of the model's parameters for policy recommendations.

3.1. Nature and Data Sources

This study assesses the money demand stability function in SSA using the linear interpolation technique to transform annual data into quarterly data from 1999 to 2023. This technique assumes constant changes between annual data points and is widely used in the literature to convert low-frequency data into high-frequency data to comply with complex statistical estimations while maintaining the trends and magnitudes of the original data. The linear interpolation equation is expressed as

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$$y = y_1 + (x - x_1)\frac{(y_2 - y_1)}{(x_2 - x_1)} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (2)$$

where: x_1 and y_1 are the first coordinates, x_2 and y_2 are the second coordinates, x is the interpolation performance point, and y is the interpolated value.

The key indicators include the real monetary aggregate (M1 and M2), real income (RGDP), foreign interest rate (FINR), real exchange rate (REC), and inflation rate (INF). The SSA countries are categorized by income levels into low-income (LI), lower-middle-income (LMI), and upper-middle-income (UMI) groups, as defined by the World Bank in Table 3, to provide a comparative analysis of money demand dynamics across different economic groups. The analysis covers long-term trends and cyclical patterns that capture the impact of economic and political events on money demand.

Table 3. Sample Countries

Panel A: Sample SSA Countries (SSA)
Angola; Benin; Botswana; Burkina Faso; Burundi; Cabo Verde; Cameroon; Central African Republic; Chad; Comoros; Congo, Dem. Rep.; Congo, Rep.; Côte d'Ivoire; Equatorial Guinea; Eritrea; Eswatini; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Mauritius; Mozambique; Namibia; Niger; Nigeria; Rwanda; São Tomé and Principe; Senegal; Sierra Leone; Somalia; South Africa; South Sudan; Sudan; Tanzania; Togo; Uganda; Zambia and Zimbabwe
Lower Middle-Income Countries (SSA-LM): GNI per capita between $1,036 and $4,045
Angola; Benin; Cabo Verde; Cameroon; Comoros; Congo, Rep.; Côte d'Ivoire; Eswatini; Ghana; Kenya; Lesotho; Mauritania; Nigeria; São Tomé and Principe; Senegal; Tanzania; Zambia and Zimbabwe
Upper Middle-Income Countries (SSA-UM): GNI per capita between $4,046 and $12,535
Botswana, Equatorial Guinea, Gabon, Mauritius, Namibia and South Africa,
Low-income countries (SSA-LI): GNI per capita of $1,035 or less
Burkina Faso; Burundi; Central African Republic; Chad; Congo, Dem. Rep.; Eritrea; Ethiopia; Guinea; Guinea-Bissau; Liberia; Malawi; Madagascar; Mali; Mozambique; Niger; Rwanda; Sierra Leone; Somalia; South Sudan; Sudan; Togo; Uganda and Gambia

Source: compiled by the authors (2024)

3.2. Variables Description
Table 4 presents detailed descriptions and key measurements of the variables used in the study.

Table 4. Variables Description and Key Measurements

Variables	Description	Unit/Expression
M1 and M2	Real monetary aggregate	Constant 2015 US dollars ($)
RGDP	Real gross domestic product (proxied a country's real income)	
REC	Real exchange rate (proxied real value of a country's currency, capture fluctuation, and variation)	US dollars
INR	Inflation rate	Percentage
FINR	Foreign interest rate	

Source: Author's work (2024) Based on data from World Bank Indicators Database (2023)
http://data.worldbank.org/data-catalog/world-development-indicators

3.3. Unit root tests

To ensure dataset stability and circumvent potential misspecifications, the Augmented Dickey and Fuller (ADF) test (1979) and Phillips and Perron (PP) tests (1988) were employed to determine whether the series follows a stochastic trend. Additionally, the Zivot and Andrews (ZA) (1992) unit root test is used to account for potential structural breaks in the series. To assess cross-sectional dependence (CD), Breusch's and Pagan's (1980) and Lagrange Multiplier (LM) test was applied to address the influence of regional economic integration among SSA countries.

3.4. Model Specification

The specifications of this study are based on a theoretical model of the cash-in-advance framework. Following Hueng (1998), the long-run panel linear specification is expressed as:

$$InM_{2it} = a_i + \vartheta_1 lnFINR_{it} + \lambda_2 lnRGDP_{it} + \theta_3 lnREC_{it} + \rho_4 lnINR_{it} + \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots\ldots.\ldots \text{ (3)}$$

Cointegration Test

This study explores the long-run link between M2 and its predictors using a cointegration approach, accounting for structural breaks and lead-lag dynamics. The Westerlund cointegration test is employed to assess the existence of a stable long-term link. The cointegration equation is expressed as follows:

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$$\Delta \text{In}_{yt} = \lambda y Iny_{t-1} + \lambda x\, Inx_{t-1} + \varpi k_t + \sum_{i-1}^{p} \vartheta iy \Delta \text{Iny}_{t-1} + \sum_{i-1}^{p} \vartheta iy \Delta \text{Inx}_{t-1}$$
$$+ \varepsilon_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (4)$$

where λ = long run; ϑ = short-run, and ϖ = trend coefficient.

The (H$_0$) of no cointegration in equation (6) is rejected if $\lambda_y = \lambda_x = 0$. The model was adopted for its capability to incorporate structural breaks and account for lead-lag length links, particularly in datasets with low-frequency observations. The Westerlund model is expressed as

$$\Delta Iny_{it} = C_i + a_i(Iny_{it-1} - b_i Inx_{it-1}) + a_{j-1}^{pj} a_{ij} \Delta Iny_{it-1} + a_{j-0}^{pj} \varphi_{ij} \Delta Iny_{it-1} +$$
$$\varepsilon_{it} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (5)$$

Reject (H_0) of no co-integration if p-value > 0.05.

Cross-Sectional (CS) -ARDL Test
The Cross-Sectional Autoregressive Distributed Lag (CS-ARDL) model, developed by Pesaran (2006) and modified by Chudik and Pesaran (2015), was adopted in this study because of its ability to account for CD, which is crucial in a region like SSA, where countries are economically and politically interconnected. By accommodating heterogeneity among countries, the CS-ARDL model offers more accurate and reliable insights, avoiding the spurious results often associated with traditional panel-data methods. The incorporation of structural breaks into the model ensures robustness against the economic and political volatility prevalent in SSA. The CS-ARDL model is expressed as follows:

$$\Delta Iny_{it} = \varphi_i Iny_{it-1} + \lambda_i Inx_{it-1} + \sum_{P=0}^{PT} \vartheta_{xip} In\ddot{X}_{t-p} + \sum_{P=0}^{PT} \vartheta_{yip} In\dot{Y}_{t-p}$$
$$+ \varepsilon_{it} \dots \dots \dots \dots . \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (6)$$

where φi is the coefficient of the lag of the dependent variable, PT is the limit of the lags in CS (P$_T \sqrt[3]{T}$), λi is the coefficient of the explanatory variables, and ε_{it} is the error term.
Table 3 Panel A presents the CS-ARDL model results, which account for CD, lags, and heterogeneous coefficients. The Hansen test ensures robustness by detecting structural breaks, confirming the stability of model parameters and the reliability of results for informed policy recommendations.

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Null hypothesis:

H_0: $\beta_i = \beta$ for all i (cross-section are independent)

H_1: $\beta i \neq \beta j$ for $i \neq j$ (each cross-section's dependence).

4. Results

The unit root test results in Table 5 Panel A show that the series is stationary at diverse order first differences I(1) and level I(0) across the income levels and panel. The structural break identified by the ZA test in 2000, 2006, 2008, 2010, 2013, 2016, and 2022 is linked to the influence of both local and international events such as the post-Cold War era and economic reforms (1999-2008); debt relief initiatives (1996-2006), the multilateral debt relief initiative (MDRI); Kenya's post-election violence (2007-2008), South Sudan's civil war (2013-present); the Eurozone debt crisis (2010-2012) indirectly impacted trade; and health crises such as the Ebola outbreak (2014-2016) and the COVID-19 pandemic (2020-present). These events disrupted economic activities, increased uncertainty, and influenced money demand in SSA and beyond. Panel B and 6 of Table 5 show that CD and cointegration exist among SSA countries, as confirmed by the Breusch-Pegan LM, Pesaran CD, and Westerlund tests. This finding supports our analysis of the predictors' impacts on M2 across various income levels in SSA.

Table 5. Cross-Sectional Dependence (CD) and Unit Root Results

Panel A:			Unit Root Test		
Variables	M2	RGDP	REC	INR	FINT
ADF I (1)	-1.90	-6.90***	-2.19	8.17***	-3.81
ADF I (0)	-4.02***	-2.11	-5.81***	2.13	-8.18***
PP I (1)	-2.91	2.00	-8.91***	6.00***	-2.99
PP I (0)	-8.81***	7.12***	-3.71	3.12	-6.11***
Zivot and Andrew I (1)	-2.56	-1.40	-2.01	-8.56***	-3.90
Zivot and Andrew I (0)	-11.80***	-6.81***	-10.23***	-1.99	-6.01***
			LMI		
ADF I (1)	-2.10	-5.16***	-5.19***	8.70***	-2.11
ADF I (0)	-5.62***	-3.00	-5.81***	6.23***	-9.18***
PP I (1)	-2.00	4.10***	-8.91***	6.00***	-3.09
PP I (0)	-6.19***	9.19***	-2.01	2.55	-9.19***
Zivot and Andrew I (1)	-3.01	-5.40***	-5.18***	-9.86***	-3.00

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Zivot and Andrew I (0)	-9.08***	-9.81***		-8.03***	-14.61***	-9.11***

UMI					
ADF I (1)	-4.01	-9.13***	-8.02***	9.31***	-8.29***
ADF I (0)	-8.41***	-9.46	-2.13	2.00	-8.250***
PP I (1)	-8.20***	7.14***	-15.21***	9.40***	-2.06
PP I (0)	-12.91***	3.01	-2.03	2.51	-7.38***
Zivot and Andrew I (1)	-2.30	-6.40***	-9.12***	-15.05***	-3.14
Zivot and Andrew I (0)	-7.82***	-3.81	-2.13	-2.51***	-9.15***

LI					
ADF I (1)	-3.23	-9.13***	-7.99***	6.89***	-6.19***
ADF I (0)	-6.39***	-9.46	-3.03	3.03	-8.25***
PP I (1)	-5.10***	7.14***	-12.01***	8.24***	-2.29
PP I (0)	-9.95***	3.01	-3.13	3.05	-8.98***
Zivot and Andrew I (1)	-1.01	-6.40***	-7.01***	-10.25***	-2.14
Zivot and Andrew I (0)	-10.68***	-3.81	-3.11	-4.15***	-8.37***

Panel B:			CD		
Variables	M2	RGDP	REC	INR	FINT
Breusch-Pegan LM test	259.111***	310.010***	130.201***	270.731***	290.013***
Pesaran CD	47.10***	11.10***	21.08***	16.00***	13.10***
LIM					
Breusch-Pegan LM test	245.091***	304.219***	103.821***	167.432***	183.763***
Pesaran CD	45.80***	21.30***	11.98***	34.10***	28.31***
UIM					
Breusch-Pegan LM test	204.820***	272.236***	219.012***	341.402***	368.103***
Pesaran CD	28.90***	23.62***	16.70***	28.69***	22.14***
LI					
Breusch-Pegan LM test	346.901***	230.810***	142.341***	100.241***	298.010***
Pesaran CD	20.52***	10.96***	21.33***	3.27***	23.10***

Source: Author's work based on E-Views 13 and data from World Development Indicators (2023) (***significance at the 5% level).

Table 6. Cointegration Results

Westerlund Test				
Statistics	Panel (SSA)	LMI	UMI	LI
Variance ratio	16.983***	10.893***	18.321***	10.893***
F-statistics	17.893***	9.345***	18.921***	10.129***
T-statistics	-12.459***	-6.012***	-13.821***	-7.378***

Source: Author's work based on E-Views 13 and data from World Development Indicators
(2023) (***significance at the 5% level).

CS-ARDL

Table 7 shows that symmetric CS-ARDL model results between M2 and its predictors (RGDP, REC, INR and FINT). RGDP, REC and FINT positively influence M2, while INR has a contractionary effect. Money demand is stable in UMI and LI countries, but unstable in LMI countries indicating the need for targeted monetary policies.

Table 7. CS-ARDL

Long-Run Elasticities: (Dependent Variable M2)				
	Panel	**LMI**	**UMI**	**LI**
RGDP	0.620 (9.556) ***	0.535 (7.454) ***	0.0525 (9.697) ***	0.417 (7.876) ***
REC	0.238 (7.711) ***	0.269 (11.939) ***	0.509 (9.697) ***	0.706 (7.961) ***
INR	-0.095 (-0.307) ***	-0.161 (-5.757) ***	-0.451 (-4.109) ***	-0.530 (-1.799) ***
FINT	0.585 (8.757) ***	0.833 (6.466) ***	0.101 (4.912) ***	0.198 (7.249) ***
Short-Run Elasticities				
RGDP	0.8033 (21.532) ***	0.149 (9.307) ***	0.9481 (5.391) ***	0.8602 (11.061) ***
REC	0.243 (7.043) ***	0.486 (8.717) ***	0.214 (4.4741) ***	0.176 (8.644) ***
INR	-0.351 (-5.528) ***	-0.108 (-7.464) ***	-0.161 (-5.757) ***	-0.764 (-9.292) ***
FINT	0.530 (5.890) ***	0.2804 (3.9698) ***	0.246 (5.633) ***	0.113 (6.778) ***

Source: Authors' work based on E-Views 13 and data from World Development Indicators
(2023) (***at 5% significance).

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Long-Run Elasticities

The panel results in Table 7 reveal that a 1% change in real GDP results in a significant 62% increase in the M2. This finding aligns with Keynesian theory, which posits that a change in GDP boosts income, thereby increasing demand for money for transactional and precautionary purposes. The findings further show that the REC and FINR changes increase M2 by 23% and 58%, respectively. The positive impact of REC on M2 supports the portfolio balance approach in which individuals adjust their portfolios based on relative returns, including money. The substantial effect of FINR on M2 indicates that SSA economies are sensitive to global financial conditions that influence domestic liquidity. Conversely, INF has a negative influence, reducing M2 by 0.09%, consistent with the quantity theory of money, which posits that high inflation erodes the real value of money, thereby decreasing demand. This effect is particularly pronounced in SSA because of high poverty rates and economic instability.

Income Level Analysis

The income level money-demand stability results in SSA are crucial for understanding a region's economic heterogeneity. The significant and diverse magnitudes of the RGDP, REC, FINR, and INF effects on M2 reveal money demand dynamics across diverse economies in the context of the SSA region. This variability has implications for the potential monetary integration in the region.

In **LMI**: RGDP, REC, and FINR influence M2 by 53%, 23%, and 83%, respectively, which is driven by transaction and capital inflow influenced by interest rate differentials and export revenues. INF decreases M2 by 0.161%, reflecting purchasing power erosion.

In **UMI**: the influence of RGDP on M2 is minimal (0.05%) due to the increased adoption of non-monetary transaction channels, such as credit and electronic payments, in most SSA countries. The significant influence of REC and FINR on M2 at 50% and 10% indicates greater market integration, reliance on imports and exports, and financial market development to absorb external shocks efficiently. INF reduces M2 by 0.45%, revealing a shift from holding money to other assets under high inflation.

In **LI**, a 1% change in RGDP, REC, and FINR increases M2 by 41%, 70%, and 19%, respectively, emphasizing the importance of exchange rate changes and the sensitivity of SSA economies to global financial conditions. INF decreases M2 by 53%, indicating a drastic decline in economic agents' motives for holding money due to a loss of confidence in the domestic currency.

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Short-Run Results

The short-run confirms the long-run findings, with increased money demand driven by government spending, foreign direct investment, and economic activity in key sectors such as agriculture, mining, and services. In LMI and LI countries, the increase is more pronounced because of higher investment opportunities and consumer spending. In the LMI countries of Benin, Tanzania, Senegal, Comoros, and Cabo Verde, low inflation rates (1.9%-2.7%) sustained confidence in the domestic currency. FINR's positive impact on M2 is moderated by capital controls and foreign exchange reserves. In UMI, weak financial infrastructure limits M2's growth.

Theoretically, the positive influence of RGDP on M2 supports the cash-in-advance theory that both long- and short-run money supply is directly proportional to the price level, while the negative impact of INF aligns with the quantity theory of money. Thus, a 1% change in inflation reduces the real value of money and demand. Policymakers need to tailor monetary and fiscal policies to effectively manage M2, considering both domestic and international economic dynamics in SSA countries. The study results for panel and income levels align with the findings of (Ncube, 2020; Mensah, 2013; Adeyeye, 2016). The negative impact of INF on M2 underscores the importance of price stability for maintaining monetary stability. Shafq and Malik (2018) and Adhikari (2019) support these findings.

Diagnostic Test Results

The diagnostic test results presented in Table 8 confirm that the CS-ARDL model was the most appropriate for this study. The post-estimation results conducted across the different SSA income levels show that the model is free from heteroscedasticity and serial correlation issues, further validating the reliability of the findings.

Table 8. Diagnostic Tests

Test	Panel	LMI	UMI	LI
Residual Normality	0.766 (0.653) ***	0.832 (0.88) ***	0.876 (0.987) ***	0.438 (0.231) ***
R^2	0.92	0.85	0.79	0.87
Breusch-Pegan Godfrey	0.34 (0.305) ***	0.66 (0.457) ***	0.63 (0.553) ***	0.46 (0.225) ***
Breusch Godfrey	0.33 (0.84) ***	0.93 (0.29) ***	0.82 (0.365) ***	0.34 (0.221) ***
Jarque Bera	1.92 (0.654) ***	0.87 (0.567) ***	3.38 (0.327)	0.74 (0.227) ***

Source: Author's work based on E-Views 13 and data from World Development Indicators (2023) (***significance at the 5% level).

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Stability of Model Parameters

Validation of the model parameters is crucial for understanding money demand dynamics in SSA. Hansen's (1992) MeanF, SupF, and LC tests are employed to assess the stability of the money demand parameter across diverse income levels in SSA.

Table 9. Stability of Model Parameters Results

SSA	Test Statistics			Remark
	MeanF	SupF	L_C	
LMI	14.981***	26.120	6.101	Reject (H_0) (Unstable)
UMI	1.813	5.110	1.012	Accept (H_0) (Stable)
LI	1.341	1.341	0.810	Accept (H_0) (Stable)

Source: Author's work based on E-Views 13 and data from World Development Indicators (2023) (***significance at the 5% level). SupF, MeanF, and Lc come from Hansen (1992), pages 327–329.

The results in Table 9 provide valuable insights into the economic and policy factors that influence the stability of money demand in SSA, aligned with the objectives of the study. The instability observed in LMI SSA countries underscores the significant challenges these economies face in terms of poor monetary policy, reliance on imports, supply chain disruptions, and volatile inflation rates. According to the quantity theory of money, such volatility erodes the real value of money, while the cash-in-advance theory further explains that a weak monetary policy impacts cash holding. The vulnerability of SSA economies to external shocks, such as exchange rate volatility, is driven by trade imbalances and capital flights. This shock exacerbates money demand instability, particularly in nations that are heavily reliant on imports. Fluctuations in exchange rates increase the opportunity costs of holding money. Additionally, the large informal sector in countries such as Tanzania and Zimbabwe, where a significant proportion of transactions occur outside formal financial systems, contributes to the unpredictability of money demand (Samuel et al. 2023c; African Development Bank, 2016). The high dependency ratios in SSA are driven by the growing young population, which negatively affects household savings and money demand stability (World Bank, 2018; Samuel et al., 2019d).

Conversely, the stability observed in UMI countries, such as South Africa and Botswana, can be attributed to prudent fiscal and monetary policies. In West and Central African nations using the CFA franc, the pegging of exchange rates to the euro contributes to the stabilization of money demand by reducing exchange rate volatility (World Bank, 2018; South African Reserve Bank, 2019; African Development Bank, 2020). Economic diversification in UMI countries also reduces

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vulnerability to commodity price shocks, supporting the stability of money demand. These findings align with cash-in-advance theory, which states that a stable economic environment fosters a consistent demand for money to facilitate transactions.

In LI countries, such as Uganda and Mali, traditional banking systems play a key role in stabilizing money demand by providing reliable financial services (World Bank, 2017). Other contributing factors include financial education initiatives, political stability, strong institutional frameworks, adherence to the rule of law, and beneficial international aid and trade agreements (SADC Economic Report, 2019; UNCTAD, 2018; Mauritius Economic Review, 2018; Botswana Institute for Development Policy Analysis, 2019).

The study's findings highlight the significance of robust economic policies and diversification strategies in achieving stable money demand, particularly in UMI countries. In contrast, instability in LMI countries highlights the need for improved monetary policies and reduced dependency on imports to mitigate external shocks. Variability in money demand across diverse income levels indicates the need for coordinated monetary policies across the region.

The implementation of common monetary policies, such as inflation-targeting frameworks, could help manage external shocks and stabilize money demand. Given the negative impact of inflation on M2, controlling inflation to restore confidence in the domestic currency is essential. Furthermore, addressing vulnerabilities such as exchange rate volatility by pegging exchange rates to more stable currencies or adopting flexible exchange rate regimes that reflect market conditions will be critical in ensuring the long-term stability of money demand in SSA.

5. Conclusions and Policy Implications

This study confirms the significant influence of macroeconomic variables on money demand in SSA with variations across income levels. The findings underscore the importance of inflation targeting and regional monetary integration in enhancing economic stability in SSA countries, decomposed into UMI, LMI, and LI income levels. Adopting a quarterly dataset from the IMF and WDI from 1999-2023, this study captures both short- and long-run impacts using the CS-ARDL model with the cash-in-advance framework to provide an all-inclusive analysis often ignored by previous studies. By testing the money demand stability function, this study distinguished the effects on the SSA economy across various countries' income levels.

The positive effect of RGDP on M2 highlights the robust link between economic growth and money demand in SSA. The positive effect of REC on M2 indicates that changes in exchange rates influence the desirability of holding domestic money. The FINR and M2 positive nexus reveals SSA's sensitivity to global financial conditions.

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The negative effect of INF on M2 is particularly severe in LI countries, where a 1% increase in inflation decreases M2 by 53%.

The income level results reveal the following: minimal impact of RGDP on M2 due to non-monetary transaction channels; significant impact of REC and FINR in UMI. In LMI, RGDP, REC, and FINR impact M2, and INF's negative impact on M2 creates instability due to high inflation and exchange rate volatility. RGDP, REC, and FINR impact M2 in LI, while INF's negative effect indicates a loss of confidence in domestic currency.

The stability of the money demand function in the UMI and LI SSA countries indicates the effective management of monetary resources. Instability in LMI countries is due to high inflation, exchange rate volatility, large informal economies, and low financial inclusion. The unit root results show that the variables are stationary at (I(1) and I(0)) excluding I(2), with cointegration confirmed across the panel and income levels. The study's findings recognize the significant influence of global financial conditions on money demand. The open economies in SSA are sensitive to international financial conditions.

The study's findings have several significant policy implications for SSA countries, principally regarding the potential benefits of monetary integration and the strategic use of monetary aggregates for policy adjustments. In general, by adopting common monetary policies or a single currency, SSA countries can mitigate volatility triggered by individual countries' currency fluctuations and inflation rates, and facilitate trade and economic growth by reducing transaction costs for cross-border trade.

The implementation of a unified monetary policy framework could increase SSA countries' negotiating power in international financial markets, leading to better trade and investment terms, and strengthening macroeconomic surveillance and fiscal discipline. The negative influence of the inflation rate on monetary aggregates highlights the importance of effective inflation targeting in achieving price stability and maintaining a stable money demand function. This study recommends an inflation-targeting regime to address future inflation rates and system asymmetries. Overall, coordinated monetary policies and effective inflation targeting can enhance the economic stability and growth of SSA countries.

For future research, this study recommends sector-specific monetary policy analysis of the stability of money demand in SSA countries to provide an understanding of the sector-specific monetary policy requirements. This study deepens the understanding of the money demand stability function in SSA countries and the income level stability effect, offering valuable insights for policymakers, academics, and stakeholders interested in the money demand stability function in SSA countries.

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Enemuo, Joy Ifeoma and Emmanuel Samuel UDO: Conceived and supervised the study. Enemuo, Joy Ifeoma, Ishaku Prince Abner, Rotimi Grace Gift: Literature review. Emmanuel Samuel UDO: Data curation and Methodology. Enemuo, Joy Ifeoma; Boniface L. Akpan: Writing-review editing.

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References

1. Adekunle, J., (1968), The demand for money: Evidence from developed and less developed economies, IMF Staff Papers, 15(2), 220-66.
2. Adeyeye, A., (2016), Financial Reforms and Money Demand in Kenya, Kenya Economic Journal.
3. Adil, M. H., Rajadhyaksha, N., (2021), Evolution of monetary policy approaches: A case study of Indian economy, Journal of Public Affairs, 21e(2113), 1–8. https://doi.org/10.1002/pa.2113.
4. Adil, M. H., Haider, S., Hatekar, N. R., (2018), Revisiting money demand stability in India: Some post-reform evidence (1996–2016), Indian Economic Journal, 66(3–4),326–346. https://doi.org/10.1177/0019466220938930.
5. Adil, M. H., Haider, S., Hatekar, N. R., (2020), Empirical assessment of money demand stability under India's open economy: Non-linear ARDL approach, Journal of Quantitative Economics, 18, 891–909. https://doi.org/10.1007/s40953-020-00203-1.
6. Adil, M. H., Hatekar, N., Sahoo, P., (2020), The impact of financial innovation on the money demand function: An empirical verification in India, Margin, 14(1), 28–61. https://doi.org/10.1177/0973801019886479.
7. Akinlo, A.E., (2006), The stability of money demand in Nigeria: An autoregressive distributed lag approach, Journal of Policy Modeling, 28(4), 445-452.
8. Albulescu, C. T., Pepin, D., (2018), Monetary integration, money-demand stability, and the role of monetary overhang in forecasting inflation in CEE countries, Journal of Economic Integration, 33(4), 841–879. https://doi.org/10.11130/jei.2018.33.4.841.
9. Asongu, S. A., Folarin, O. E., Biekpe, N., (2020), The long-run stability of money in the proposed East African monetary union, Journal of Economic Integration, 35(3), 457–478. https://doi.org/10.11130/jei.2020.35.3.457.

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10. Azimi, Naim, M., Shafq, M. M., (2020), Hypothesizing directional causality between the governance indicators and economic growth: The case of Afghanistan, Future Business Journal, 6(35), 1–14. https://doi.org/10.1186/s43093-020-00039-4.

11. Barnett, W. A., Ghosh, T., Adil, M. H., Barnett, W. A., Ghosh, T., Adil, M. H., (2021), Is money demand really unstable? Evidence from divisia monetary aggregates (WP-2021-005) (issue February). http://www.igidr.ac.in/pdf/publication/WP-2021-005.pdf.

12. Baumol, W.J., (1952), The transactions demand for cash: An inventory theoretic approach, The Quarterly Journal of Economics, 66(4), 545-556.

13. Ben-Salha, O., Jaidi, Z., (2014), Some new evidence on the determinants of money demand in developing countries - a case study of Tunisia, The Journal of Economic Asymmetries, 11, 30–45. https://doi.org/10.1016/j.jeca.2014.06.001.

14. Breusch, T. S., Pagan, A. R., (1980), The Lagrange multiplier test and its applications to model specification in econometrics, The Review of Economic Studies, 47(1), 239–253. https://doi.org/10.2307/2297111.

15. Chaisrisawatsuk, S., Sharma, S. C., Chowdhury, A. R., (2004), Money demand stability under currency substitution: Some recent evidence, Applied Financial Economics, 14 (4), 19–27. https://doi.org/10.1080/0960310042000164194.

16. Chowdhury, A. R., (1995), The demand for money in a small open economy: The case of Switzerland, Open Economies Review, 6(2), 131–144. https://doi.org/10.1007/BF01001233.

17. Chudik, A., Pesaran, M. H., (2015), Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors, Journal of Econometrics, 188(2), 393–420. https://doi.org/10.1016/j. jeconom.2015.03.007.

18. Daniele, V., Foresti, P., Napolitano, O., (2017), The stability of money demand in the long-run: Italy 1861–2011, Cliometrica, 11, 217–244. https://doi.org/10.1007/s11698-016-0143-8.

19. Dickey, D. A., Fuller, W. A., (1979), Distribution of the estimators for autoregressive time series with a unit root, Journal of The American Statistical Association, 74(366a), 427–431. https://doi.org/10.2307/2286348.

20. Dogru, B., Recepoglu, M., (2013), Dynamic analysis of money demand function in Turkey, International Journal of Economics and Finance, 5(9), 20–27. https://doi.org/10.5539/ijef.v5n9p20.

21. Drakos, A. A., Kouretas, G. P., (2015), The conduct of monetary policy in the Eurozone before and after the financial crisis, Economic Modelling, 48, 83–92. https://doi.org/10.1016/j.econmod.2014.11.010.

22. Folarin, O. E., Asongu, S. A., (2019), Financial liberalization and long-run stability of money demand in Nigeria, Journal of Policy Modeling, 41(5), 963–980. https://doi.org/10.1016/j.jpolmod.2019.04.005.

23. Friedman, M., (1988), Money and the stock market, Journal of Political Economy, 96(2), 221-245.

24. Hameed, M. A., Rahman, M. M., Khanam, R., (2022), Assessing the asymmetric war growth nexus: A case of Afghanistan, PLoS One, 17(8), Article e0272670. https://doi.org/10.1371/journal.pone.0272670.

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25. Hamori, S., Hamori, N., (2008), Demand for money in the Euro area, Economic Systems, 32(3), 274-284.

26. Hansen, B. E., (1992), Tests for parameter instability in regressions with I(1) processes, Journal of Business & Economic Statistics, 10(3), 321–335. https://doi.org/10.2307/1391545.

27. Herve, D.B.G., Shen, Y., (2011), The demand for money in Cote d'Ivoire: Evidence from the cointegration test, International Journal of Economics and Finance, 3(1), 188-198.

28. Hueng, C. J., (1998), The demand for money in an open economy: Some evidence for Canada, The North American Journal of Economics and Finance, 9(1), 15–31. https://doi.org/10.1016/s1062-9408(99)80078-3.

29. Kapingura, F.M., (2014), The stability of the money demand function in South Africa: A var-based approach, The International Business and Economics Research Journal, 13(6), 1471.

30. Karaman, K. K., Pamuk, S., Yıldırım-Karaman, S., (2020), Money and monetary stability in Europe, 1300–1914, Journal of Monetary Economics, 115, 279–300. https://doi.org/10.1016/j.jmoneco.2019.07.007.

31. Keynes, J.M., (1936), The General Theory of Employment, Interest and Money. Vol. 7. London, United Kingdom: Palgrave Macmillan; 1971-9.

32. Khan, M. A., Ahmed, A. M., (2016), Conducting monetary policy in South Asian economies: An investigation, Pakistan Development Review, 55(3), 161–190. https://doi.org/10.30541/v55i3pp.161-190.

33. Kumar, S., Webber, D.J., Fargher, S., (2013), Money demand stability: A case study of Nigeria, Journal of Policy Modeling, 35(6), 978-991.

34. Mensah, J., (2013), Monetary Policy in Ghana. Ghana Economic Review.

35. Mera, V. I., Silaghi, M. I. P., Turcu, C., (2020), Economic sentiments and money demand stability in the CEECs, Open Economies Review, 31, 343–369. https://doi.org/10.1007/s11079-019-09558-2.

36. Miller, S. M., Martins, L. F., Gupta, R., (2019), A time-varying approach to the US welfare cost of inflation, Macroeconomic Dynamics, 1–23. https://doi.org/10.1017/S1365100517000037.

37. Narayan, P. K., (2010), Modeling money demand for a panel of eight transitional economies, Applied Economics, 42, 3293–3305. https://doi.org/10.1080/00036840802112323.

38. Nchor, D., Adamec, V., (2016), Investigating the stability of money demand in Ghana, Procedia-Social and Behavioral Sciences, 220, 288-293.

39. Ncube, M., (2020), Study on Monetary Aggregates in Nigeria, Journal of African Economies.

40. Nepal, R., Paija, N., (2020), Stability of money demand function in the SAARC region: A panel co-integration approach, Journal of Economic Integration, 35(1), 111–128. https://doi.org/10.11130/jei.2020.35.1.111.

41. Neupane, D., (2019), The demand for money in Nepal: An analysis using vector error correction model, Prithvi Academic Journal, 2, 10–17. https://doi.org/10.3126/paj.v2i0.31502.

Studia Universitatis "Vasile Goldis" Arad. Economics Series Vol 35 Issue 4/2025
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42. Pedroni, P., (1999), Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxford Bulletin of Economics & Statistics, 61(s1), 653–670. https://doi.org/10.1111/1468-0084.0610s1653.

43. Pesaran, M. H., (2006), Estimation and inference in large heterogeneous panels with a multifactor error structure, Econometrica, 74(4), 967–1012. https://doi.org10.1111/j.1468-0262.2006.00692.x.

44. Pesaran, M. H., Shin, Y., Smith, R. J., (2001), Bounds testing approaches to the analysis of level relationships, Journal of Applied Econometrics, 16, 289–326. https://doi.org/10.1002/jae.616.

45. Phillips, P. C. B., Perron, P., (1988), Testing for a unit root in time series Biometrika, 75(2), 335–346. https://doi.org/10.1093/biomet/75.2.335.

46. Samuel, U. E., Jack, A. E., Prince, A. I., Kingsley, I., Victor, N., (2019b), Finance-Led Growth and Growth-Led Finance: Evidence from Nigeria Economic and Financial Sector Development, Humanities and Social Sciences Letters, 7(4), 191–198. https://doi.org/10.18488/journal.73.2019.74.191.198.

47. Samuel, U. E., Prince, A. I., Ndubuaku, V., Udoh, B. E., Okoh, J. I., (2023c), Effect of FinTech on cash holding: Quarterly evidence from Nigeria, The Economics and Finance Letters, 10(2), 172–183. https://doi.org/10.18488/29.v10i2.3407.

48. Samuel, U. E., Udoh, B. E., Prince, A. I., Okoh, J. I., Ndu, O. M., (2019d), Money Supply and Inflation Rate in Nigeria: The Missing Link, Humanities and Social Sciences Letters, 7(2), 156–166. https://doi.org/10.18488/journal.73.2019.73.156.166.

49. Shafq, H., Malik, W. S., (2018), Money demand function revisited: The role of asset prices in Pakistan, Pakistan Economic and Social Review, 56(1), 67–92.

50. Sowa, N.K., (1993), The Nature of Monetary Policy and the Financial Sector in Ghana, Monetary Policy in Developing Countries. London: Routledge.

51. Tobin, J., (1956), The interest-elasticity of transactions demand for cash, The Review of Economics and Statistics, 38(3), 241-247.

52. Udo, S. E., Prince, A. I., Edet, I. V., Manasseh, C. O., Daniel, C. O., Okanya, O. C., Mgbobi, I. C., Onwumere, J. U. J., (2023b), Financial Technology and Economic Growth Nexus: Quarterly Evidence From Nigeria, Seybold Report Journal, 18(07), 106-129. 10.5110/77.9127. (n.d.-b). https://doi-ojs.org/10-5110-77-9127/.

53. Udoh, B. E., Ishaku Prince Abner, Joy Ifeoma Enemuo, Shedrack Chinwuba Moguluwa, Catherine Chinyere, Ikechukwu Attamah, Udo, E. S., (2023), Oil Price Fluctuation, Business and Economic Growth Effect: Evidence from Nigeria, European Journal of Sustainable Development, 12(2). https://doi.org/10.14207/ejsd.2023.v12n2p119.

54. Wang, Y., (2011), The stability of long-run money demand in the United States: A new approach, Economics Letters, 111(1), 60–63. https://doi.org/10.1016/j.econlet.2011.01.001.

55. Westerlund, J., (2007), Testing for error correction in panel data, Oxford Bulletin of Economics & Statistics, 69, 305–9049. https://doi.org/10.1111/j.1468-0084.2007.00477.x.

56. World Bank, (2018), Demographic and Health Surveys: Financial Behavior in Sub-Saharan Africa.

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57. World Bank, (2010), The Impact of the Global Financial Crisis on Sub-Saharan Africa. World Bank Policy Research Working Paper No. 5208.

58. World Bank, (2019), World Development Report: Political Instability Index.

59. Zivot, E., Andrews, D. W. K., (1992), Further evidence on the great crash, the oil price shock, and the unit-root hypothesis, Journal of Business & Economic Statistics, 10(3), 251–270. https://doi.org/10.1080/07350015.1992.10509904.

60. Zuo, H., Park, S. Y., (2011), Money demand in China and time-varying cointegration, China Economic Review, 22(3), 330–343. https://doi.org/10.1016/j.chieco.2011.04.001.

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