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-RESEARCH ARTICLE-

ANALYSING THE EFFECT OF INTEREST RATES ON MONEY DEMAND USING AUTOREGRESSIVE DISTRIBUTED LAG (ARDL) MODELS

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—Abstract—

This research examines quarterly data spanning from 2008 to 2023 to investigate the interrelationship between government revenue, money demand, and both lending and deposit interest rates in Jordan. The objective is to shed light on the interactions among money demand, interest rate variability, and income fluctuations. Specifically, the study evaluates how lending interest rates (LIR), deposit interest rates (DIR), and gross domestic product (GDP) influence the broad money supply (M2). To assess both the short-run and long-run dynamics among these variables, the study employs the bounds testing procedure for cointegration, particularly through the Autoregressive Distributed Lag (ARDL) model. Unit root test outcomes indicate that the variables are integrated at mixed orders, I(0) and I(1), justifying the application of the ARDL methodology. The bounds test confirms the existence of a long-term equilibrium relationship among the selected variables. Nevertheless, the long-run coefficients do not suggest statistically significant causal effects of the explanatory variables on money demand. Diagnostic tests affirm that the model does not exhibit issues such as serial correlation, heteroscedasticity, or misspecification. The empirical evidence contributes to a broader understanding of monetary transmission mechanisms in economies characterised by fixed exchange rates and nascent, developing financial sectors. The findings reveal that lending interest rates exert a negative influence on long-run money demand, while deposit interest rates maintain a positive yet marginal impact. In contrast, short-run money demand appears insensitive to interest rate changes. Moreover, the results demonstrate that the model's parameters are stable over time, with an estimated speed of adjustment towards long-run equilibrium of 3.8%. The study recommends that the Central Bank adopt measures to stabilise interest rate fluctuations, thereby enhancing the appeal of commercial banks to potential depositors and supporting private sector investment activities.

Keywords: Money Demand, Interest Rates, Deposits, Loans, Income, ARDL, Cointegration, and Jordan.

INTRODUCTION

The concept of money demand represents a fundamental economic principle vital to the functioning of modern economies. It refers to the aggregate amount of currency holdings that various institutions and economic agents maintain over a given period, contingent upon prevailing macroeconomic conditions. An in-depth analysis of money demand is critical for ensuring economic stability, as it significantly influences price levels, investment decisions, and overall economic performance . The examination of money demand in the Jordanian context holds particular relevance, given the nation's limited natural resources, its reliance on external financial assistance, and its vulnerability to economic shocks from the broader region (Moh'd Al-Tamimi et al., 2023). Interest rate volatility—defined as the degree of fluctuation in interest rates over

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time—plays a pivotal role in influencing several macroeconomic activities, including saving behaviour, investment patterns, and consumption levels. Such fluctuations can pose threats to economic stability and growth, directly impacting the demand for money. Consequently, Jordanian policymakers have maintained a sustained focus on interest rate stability, particularly in response to inflationary pressures and broader economic uncertainties.

With a population exceeding 11.6 million, Jordan is categorised as a lower-income country situated in Southwest Asia. Historically, the nation has experienced episodes of inflation and varying levels of macroeconomic stability. These conditions have contributed to challenges within the financial system and have constrained efforts to attract foreign direct investment. Although Jordan's banking infrastructure has seen notable improvements in recent years, and macroeconomic conditions have generally stabilised, interest rate volatility remains a persistent concern. This volatility continues to influence the demand for money, with implications for national economic stability and long-term growth, thereby remaining a central issue for economic policymakers. Over the past decades, academic scholarship has extensively explored the determinants of money demand, consistently identifying interest rates and GDP as primary influencing factors (Asghar & Hussain, 2014). Interest rates—both for deposits and loans—serve as a cost mechanism and an incentive structure that shapes how households and firms allocate their monetary assets. GDP, as a key indicator of economic activity, reflects transactional needs across the economy and necessitates prudent monetary balance management. These variables are instrumental in the formulation of central banks' monetary transmission mechanisms, which are designed to steer economic outcomes at the national level (Boukhatem & Djelassi, 2022).

Investigating money demand in Jordan yields distinctive perspectives, given the country's macroeconomic and institutional characteristics. Operating under a fixed exchange rate regime linked to the US dollar, Jordan's capacity to independently adjust monetary policy is constrained (Chelghoum et al., 2023). Therefore, a nuanced understanding of the determinants of money demand is essential for addressing the operational limitations this system imposes on macroeconomic governance. Recent reforms within the banking sector and broader financial liberalisation efforts have altered traditional money demand relationships by introducing greater regulatory oversight and fostering sectoral resilience (El Yamani, 2024). Numerous theoretical models have been developed to interpret the interconnections among money demand, interest rates, and income levels. The Quantity Theory of Money posits that the demand for money primarily arises from transactional needs within the economy. This theory establishes a direct relationship among the money supply, the velocity of circulation, and nominal GDP. From this standpoint, an increase in GDP is expected to generate a proportionate rise in money demand, given the need for additional currency to support increased economic transactions (Akinlo, 2012).

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Further refinement is introduced through the Baumol-Tobin model, which integrates the concept of opportunity cost into the analysis of money demand. Drawing upon principles of inventory management, this model asserts that economic agents determine their money holdings by weighing the cost of converting money into investment assets against the interest foregone on cash balances. The model suggests that rising income leads to greater money demand, whereas higher interest rates on alternative assets reduce it. In the context of Jordan, empirical observations indicate that rising deposit interest rates tend to reduce currency holdings, as individuals reallocate funds into interest-bearing accounts. Keynesian liquidity preference theory offers an alternative perspective, identifying three motives behind money holdings: transactional, precautionary, and speculative. In particular, the speculative motive alters the simplistic inverse relationship between interest rates and money demand suggested by the Quantity Theory. Within this framework, individuals closely monitor interest rate movements, adjusting their holdings based on the opportunity costs of holding money versus potential investment returns (Weiping, 2024).

Friedman's modern approach treats money as part of a broader portfolio of assets, influenced by four key variables: permanent income, expected returns on alternative assets, inflation expectations, and personal preferences. This model maintains that income positively influences money demand, while interest rates exert more complex effects by representing both the cost of holding money and general economic expectations (Ali Mohamed et al., 2024). Recent extensions of these foundational models, such as the Buffer Stock approach, argue that individuals maintain reserve balances to manage unforeseen expenditures. According to this model, money demand responds gradually to shifts in macroeconomic indicators, including interest rates and GDP, thus explaining observed time lags in behavioural adjustments (Roussel et al., 2021).

Scholars have challenged classical theories by illustrating how developments in financial technology and innovation disrupt established relationships. Proponents argue that improved credit access, digital payments, and expanded financial services have reshaped the responsiveness of money demand to traditional determinants such as interest rates and income levels (Trapanese & Lanotte, 2023). In Jordan's case, while conventional factors still influence monetary behaviour, evidence suggests that financial sector transformation has introduced new dynamics. Empirical investigations using Jordanian data reveal mixed results regarding the impact of interest rates on money demand. The contrasting effects of borrowing costs and deposit returns often yield ambiguous conclusions. Traditional analyses tend to employ aggregate interest rate measures, without disaggregating lending and deposit rates, thereby obscuring important nuances in their influence on money demand.

Given the significant spread between lending and deposit interest rates in Jordan, this distinction is particularly relevant. The country's unique economic structure,

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characterised by limited natural resources and constrained fiscal flexibility, necessitates a careful evaluation of how money demand responds to GDP changes. Jordan's financial sector characteristics, combined with broader structural factors, result in observed deviations between theoretical income elasticity predictions and empirical realities (Epaphra, 2017). Understanding the mechanisms that link central bank policy interventions with actual monetary behaviour is essential but complex. Policymaking can be jeopardised when it is based on inaccurate assumptions about these relationships, thereby increasing the risk of unintended macroeconomic consequences. Previous studies on Jordan's money demand have primarily relied on annual data, which may conceal short-term fluctuations and seasonal variations. By examining quarterly data from 2008 to 2021, this study captures detailed temporal trends and accounts for specific episodes of economic restructuring that influenced monetary dynamics.

There remains a pressing need to re-evaluate traditional money demand models in light of Jordan's evolving financial landscape. Expanding banking access, enhanced regulatory oversight, and the digitalisation of financial services are all factors that could alter the traditional roles of interest rates and income in determining money demand. A nuanced understanding of these changes is imperative for designing effective monetary policy frameworks. This study addresses these research gaps by investigating the relationship between interest rates (both lending and deposit), GDP, and money demand using Jordanian quarterly data from 2008 to 2021. The results offer valuable insights into the functioning of monetary policy in the Jordanian context (Moh'd Al-Tamimi et al., 2023). By separately analysing the effects of lending and deposit rates alongside GDP trends, the study provides empirical evidence to support more precise policy calibration. A clearer understanding of money demand behaviour will enable policymakers to better evaluate monetary pressures, anticipate risks to stability, and promote sustainable economic growth.

This research contributes to the academic discourse on evolving money demand behaviour in developing economies with fixed exchange rate regimes. It critically assesses the relevance of traditional theoretical models in Jordan's contemporary setting and offers integrative findings that link monetary theory with empirical realities. The study fills important knowledge gaps by separately examining the impacts of loan and deposit interest rates, along with income fluctuations, on money demand. These insights can enhance monetary policy effectiveness and support economic resilience in countries facing complex and multidimensional economic challenges. The central motivation of this study is to assess how interest rate variability affects money demand in Jordan and to provide empirical evidence that can inform sound policy decisions. The objectives of the study are as follows:

(a) To investigate the short-term and long-term effects of interest rate fluctuations on the demand for money in Jordan.

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(b) To propose policy recommendations that support economic growth and financial stability.

REVIEW OF THEORETICAL LITERATURE AND PREVIOUS STUDIES

Theory of Liquidity Preference

The liquidity preference theory, originally introduced by John Maynard Keynes in his 1936 publication The General Theory of Employment, Interest, and Money, offers an explanation for individuals' inclination to hold money. The theory posits that money is the most liquid asset, primarily because it can be readily utilised to meet daily expenses. Liquidity plays a pivotal role, especially as commercial banks manage client deposits and are required to maintain highly liquid assets to meet immediate withdrawal demands (Hicks, 1936). The volume of money held for precautionary purposes is influenced by multiple factors, including prevailing interest rates, consumer expenditure patterns, and market dimensions. A further motive, as proposed by Keynes, is the speculative motive, whereby individuals retain money to capitalise on future investment opportunities in financial assets and securities.

However, Keynes's framework has faced critique. As noted by Rothbard (2012), critics argue that interest rates are influenced by a broader set of variables beyond those encompassed within liquidity preference theory. Specifically, it has been suggested that Keynes offered limited insight into the determination of long-term interest rates, placing disproportionate emphasis on short-term rate dynamics. Despite such criticisms, liquidity preference remains a central concern for monetary policymakers. Central banks across the globe regulate interest rates to achieve macroeconomic objectives such as price stability and sustainable output. Interest rates serve as a primary instrument within monetary policy frameworks to influence economic activity. Additionally, the Fisher effect provides an alternative explanation of interest rate behaviour, asserting that nominal interest rates adjust in response to changes in expected inflation. This relationship implies that higher inflation expectations are typically associated with increased nominal interest rates.

The Money Quantity Theory (QTM)

The QTM forms the traditional basis for understanding monetary policy and posits a direct relationship between the money supply and the overall price level in an economy. In contrast, Keynesian economists argue that variations in the money supply exert only indirect effects on economic activity (Cline & Mazumder, 2022). According to Keynes, the propensity to save is largely dictated by household income rather than the prevailing interest rate levels. He asserts that as household income increases, savings also rise correspondingly, while even notable fluctuations in interest rates have limited influence on saving behaviour. Keynes further maintains that lower interest rates stimulate both consumer expenditure and private investment, ultimately leading to higher real GDP.

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He remains sceptical about the effectiveness of monetary policy in controlling money supply growth, proposing instead that fiscal policy provides a more direct mechanism for influencing real output and investment returns. Consequently, Keynesians attribute greater importance to fiscal interventions over monetary tools in achieving macroeconomic objectives. In essence, while the Quantity Theory underpins conventional monetary policy frameworks, Keynesians contend that monetary supply changes affect the economy through more indirect channels. Understanding these divergent theoretical perspectives is crucial for economists and policymakers seeking to design and implement effective economic strategies. In the context of the quantity theory of money, Irving Fisher formulated the following equation:

$MV = PY$,
V: Trading Speed,
P: Price Level,
Y: Real Income,
PY: Level of Real GDP or Real Income.

The classical view of monetary policy is based on the quantity theory of money, whereas Keynesians argue that money is demanded for transactions, speculation, and precaution, with changes in money supply indirectly affecting real GDP rather than directly influencing price levels.

Theory of Loanable Funds

The loanable funds theory, as initially proposed, asserts that interest rates are determined by the interaction between the supply and demand for loanable securities (Jaimovich et al., 2021). This framework emphasises that savings and investments must be based on real, substantive economic requirements, aligning with neoclassical economic thought that highlights the roles of productivity and saving in shaping interest rate dynamics. The theory posits that the availability of loanable funds is the principal factor influencing interest rates. These funds are affected by several variables, including the level of aggregate savings, preferences for liquidity, the capacity to attract new capital, and the expansion of currency deposits within financial institutions. According to this theory, nominal interest rates emerge from the equilibrium between the supply and demand for loanable funds. An increase in demand, assuming a constant supply, will cause interest rates to rise; conversely, a rise in supply with stable demand will drive interest rates down. Thus, shifts in the quantity of available loanable funds directly influence the prevailing interest rate. In essence, fluctuations in interest rates reflect ongoing changes in the balance between loanable funds supplied and demanded within financial markets.

Literature Evaluations

Numerous studies have explored the impact of international interest rate variations on

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money demand in developing economies. In the context of Jordan, Al-Dhaimesh et al. (2023) questioned the robustness of earlier research for failing to assess the stability of the money demand function. The study employed the Johansen cointegration technique alongside the Granger causality test and demonstrated that, over the long term, a relationship exists between money supply, income, and interest rates. Similarly, Alhannom (2016) examined the interactions among real money balances, income, and interest rates using the Dynamic Ordinary Least Squares (DOLS) approach.

In contrast, Batarseh (2021) did not detect a long-term equilibrium among the studied variables. This researcher analysed the causal relationships between monetary expansion—defined through GDP, GDP growth, inflation, and broad money growth—and observed a bidirectional short-run causality between money supply growth and inflation. In another empirical investigation, Maghyereh (2002) assessed whether the broad money demand function in Jordan, covering the period from 1976 to 2000, exhibited stability. Using cointegration and an error correction framework, the analysis of quarterly data confirmed that money demand remained stable throughout the study period, even though substantial financial liberalisation occurred post-1988. Moreover, inflation was identified as the most significant determinant influencing money demand within the Jordanian economy. Further insight into the true drivers of M2 demand in Jordan was provided by (Manasseh et al., 2021), whose ARDL model findings revealed that, in the short run, both GDP and inflation had a significant and positive effect on money demand. In the long run, while interest rates were found to exert a statistically significant negative impact, real GDP, inflation, and the budget deficit maintained positive and significant relationships with M2. Several other studies also support the use of macroeconomic indicators—such as interest rates, real GDP, inflation, and fiscal balance—as reliable predictors of money demand in Jordan (Mukhtarov et al., 2020; Motsewakgosi, 2019; Rahman et al., 2020; Saed & Al-Shawaqfeh, 2017; Shaheen et al., 2015).

METHODOLOGY

This study investigates the relationship among interest rates, income, and money demand in the Jordanian economy by employing quarterly data spanning from 2008 to 2021. The analysis focuses on three principal variables: borrowing interest rates, savings interest rates, and money demand. The dataset was sourced from the Central Bank of Jordan. To explore both short-term and long-term dynamics, the study adopts the ARDL cointegration framework. This model employs the conventional Least Squares (LS) regression method, incorporating lagged values of both dependent and independent variables as explanatory factors, as outlined by (Pesaran & Shin, 1996) and (Kripfganz & Schneider, 2020). The initial stage of the analysis involved conducting unit root tests to ascertain the integration order of each variable. Given that many economic time series are typically non-stationary, unit root testing is essential in contemporary econometric practice. The Augmented Dickey-Fuller (ADF) test was

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applied to determine the presence of unit roots at both level and first-difference stages (Nasseri Oskouie et al., 2020). The ARDL model is appropriate when the underlying series are either stationary at level I(0), at first difference I(1), or a combination thereof. However, its application becomes invalid when variables are integrated at the second order I(2) or exhibit stationarity beyond the permissible range (Digilina et al., 2020; Washington et al., 2020). Overall, this model allows for the systematic evaluation of how interest rate fluctuations impact the demand for money in Jordan, thereby providing critical insights for researchers and policymakers. The findings aim to inform monetary policy decisions and contribute to a deeper understanding of financial stability mechanisms (Ali Mohamed et al., 2024; Kausar & Sahi, 2021).

SPECIFICATIONS FOR THE MODEL

This study explores the relationship between LIR, DIR, and M2 using econometric techniques. To achieve this aim, the following model is proposed:

$$M2 = (DIR, LIR, GDP) \quad (1)$$

To validate the relationships within this model, the study employs various statistical tools within an econometric framework. The aim is to provide insights that can inform future research and support more effective policy formulation.

Where,

M2: Wide Money Supply,
DIR: Interest Rates on Deposits,
LIR: Interest Rates on Loans,
GDP: Gross Domestic Product.

The standard estimation model is formulated as follows:

$$M2 = \beta_0 + \beta_1 \text{GDP} + \beta_2 DIR_2 + \beta_3 LIR_3 + \mu_t \quad (2)$$

β_0: Intercept Term (Constant),
$\beta_1 \neq \beta_2 \neq \beta_3$: Coefficients of the Variables,
μ_t: Stochastic Error.

From Equation (2), the study derives its logarithmic form as follows:

$$\text{Ln}\,(M2) = \beta_0 + \beta_1 \ln\,(\text{GDP}) + \beta_2 \ln\,(dir_2) + \beta_3 l(lir_3) + \mu_t \quad (3)$$

Therefore, the ARDL model can be specified as follows:

$$Y_t = \tau_{0i} + \sum^{p} \delta_i y_{t-1} + \sum^{q} \hat{\beta}_\iota X_{t-1} + \varepsilon_{it} \quad (4)$$

Y_t denotes the dependent variable vector, while X_t includes explanatory variables that

may be integrated of order I(0), I(1), or a mixture of both. δ and β represent the coefficient vectors, and τ is the intercept term. The indices $i = 1$, k, along with p, q indicate the optimal lag lengths. Lastly, ε_{it} stands for the stochastic error term.

The bounds testing procedure and the ARDL model are specified as follows:

$$\Delta lnM2 = \alpha_{01} + \beta_{11}\ lnM2_{t-1}\ p + \beta_{21}\ lnGDP_{t-i} + \beta_{31}\ lnDIR_{t-1}\ q1 + \beta_{41} lnLIR_{t-1} + \sum \alpha_{1i}\Delta lnM2_{t-1} + \sum \alpha_{2i}\Delta lnGDP_{t-i} + \sum \alpha_{2i}\Delta lnDIR_{t-i} + \sum \alpha_{3i}\Delta lnLIR_{t=i} + \varepsilon_{1t} \quad (5)$$

If the variables in Equation (5) exhibit a long-term relationship or are cointegrated, the ECM can be specified as follows:

$$\Delta lnM2_t = \alpha_0 + \sum \alpha_{1i}\Delta lnM2_{t-i} + \sum \alpha_{2i}\Delta lnGDP_{t-1} + \sum \alpha_{3i}\,\Delta lnDIR + \sum \alpha_{4i}\, lnLIR + \lambda ECT_{t-1} + \varepsilon_{t-1} \quad (6)$$

Where $\lambda = (\sum_{i=1}^{p} \delta_i)$ represents the speed of the correction factor that is less than 1 and negative, while ECT_{t-1} represents the error correction term for one lag period. Finally, $\alpha 1i, \alpha 2i, \alpha 3i, \alpha 4i$ are the short-term dynamic coefficients of the long-term correction equilibrium of the model. The anticipated signs of the explanatory variables are: DIR < 0, LIR, GDP > 0.

Unit Root Test

The presence of unit roots in the variables at both the level and first difference was assessed using the ADF test (Dickey & and Fuller, 1979). The Akaike Information Criterion (AIC) was employed to determine the optimal lag length, with a maximum limit of 10 lags. The null hypothesis of the test posits that the variables exhibit unit roots. The results presented in Table 1 provide evidence of whether unit roots are present in the variables under examination. This step is of particular importance, as unit root tests are commonly applied in the analysis of economic time series. The application of the ADF test in this study represents a notable advancement, offering a robust and reliable method for detecting unit roots in the variables analysed. These findings contribute to the broader research landscape and provide valuable insights to inform policy decisions.

Table 1: Unit Root Test

ADF Test						
Variables	**Level**		**1st Difference**		**Significance Level**	**Integration Order**
	τ-Statistic	**Prob.**	**τ-Statistic**	**Prob.**		
LNM2	-3.49	0.048	-	-	5%	I(0)
LNGDP	-2.99	0.14	-4.07	**0.002**	1%	I(1)
LN(LIR)	-5.83	0.0001	-	-	1%	I(0)
LN(DIR)	-4.14	0.0017	-	-	1%	I(0)

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The results of the ADF test at both the level and first difference are presented in Table 1. According to the respective t-statistics of -2.99 and 1.24, along with P-values of 0.14 and 0.94, the findings reveal that LNGDP and LNM1 are non-stationary at the level. However, upon examining the first difference, the t-statistics of -4.07 and -1.74, which correspond to P-values of 0.002 and 0.07, indicate that these variables are stationary at the first difference, corresponding to an integration of the first order.

RESULTS

The results led to the conclusion that the variables in this study are integrated at both the first difference and the level, thereby meeting the ARDL integration criteria as established by the ADF unit root test outcomes. The results offer significant understanding of how changes in interest rates influence the demand for money within the Jordanian economy, a crucial factor in time series analysis.

Bounds Test for Cointegration

The study employed the bounds test to explore the long-term relationship between the variables, with the findings displayed in Table 2. As indicated in Table 2, the calculated statistic of 5.559 surpasses both the lower and upper bounds. As a result, the null hypothesis, which assumes no long-term relationship between the variables, is rejected. The critical values of the upper bound at 10%, 5%, 2.5%, and 1% are 3.35, 3.87, 4.38, and 5, respectively. Thus, the alternative hypothesis, proposing a long-term correlation between the variables, is upheld.

Table 2: Bound Test

Null Hypothesis: No Levels Relationship				
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-Statistic	5.559726	10%	2.63	3.35
K	2	5%	3.1	3.87
		2.50%	3.55	4.38
		1%	4.13	5

Long-Term Relationship

Table 3 displays the results of the long-term relationship determined by the ARDL model.

Table 3: ARDL Long-Run Specification and Bounds Testing

Dependent Variable: m2				
Selected Model: ARDL(1, 1, 0, 0)				
Variable	**Coefficient**	**Std. Error**	**T-Statistic**	**Prob.**
Gdp	-0.025725	1.094948	-0.023494	0.9813
lir	-1.780477	0.964601	-1.845817	0.0701
dir	0.45737	0.343338	1.332125	0.1881
C	14.05933	11.26602	1.247941	0.2172
EC = LOG(M2) - (-0.0257*LOG(GDP) -1.7805*LOG(LIR) + 0.4574*LOG(DIR) + 14.0593)				

Using a (1,1,0,0) lag structure, based on Akaike's Information Criterion, the estimated

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long-run relationship between the independent variables (log GDP, log DIR, log LIR) and the dependent variable (log M2) shows no significant long-term correlation. The estimated coefficient for DIR is -0.4573, which suggests a positive relationship. This indicates that a 1% increase in deposit rates would result in a 0.4573-fold increase in the broader money supply; however, this effect is not statistically significant. Conversely, the estimated coefficient for LIR is -1.7804, indicating a negative relationship. A 1% increase in lending rates would reduce the demand for broad money by 1.7804 times, a result that is statistically significant.

ARDL Error Correction Model (ECM) Estimation (1,1,0,0)

The estimated short-run coefficients are presented in Table 4, with the lag period determined using Akaike's Information Criterion. Based on the ECM results, the coefficient for CointEq(-1) is -0.038, which is negative and less than one. This indicates that any disequilibrium from the previous period is corrected at an average rate of 3.8% over the time period analysed. The estimated coefficient for Δ_{GDP} is positive and statistically significant, suggesting that an increase in GDP leads to a 0.05-fold increase in broad money. This finding highlights a modest yet positive short-term effect of GDP growth on the Jordanian economy.

Table 4: ARDL (1,1,0,0) ECM Estimation

Dependent Variable: Δm2				
	Coefficient	**Std. Error**	**T-Statistic**	**Prob.**
Δ*gdp*	0.054565	0.019913	2.74019	0.0082
CointEq(-1)	-0.038405	0.003187	-12.05111	0

Test Diagnostic

To verify the accuracy and reliability of the standard models in Table 5, several diagnostic tests were performed. The "Breusch-Godfrey Serial Correlation LM test" revealed no significant autocorrelation in the residuals, as both the Chi-Square and F-Statistic probabilities exceeded 5%, leading to the acceptance of the null hypothesis. Additionally, the "Breusch-Pagan-Godfrey test" was employed to assess residual heteroscedasticity. The results showed that the probability values for both the chi-square and F-statistic were above 5%, indicating that the residuals were homoscedastic. Therefore, based on the analysis and residual plot, the residuals exhibited homoscedasticity, which further supported the null hypothesis.

Table 5: Autocorrelation Test and Heteroscedasticity Test

Breusch-Godfrey Serial Correlation LM Test			
Null Hypothesis: No Serial Correlation at up to 1 Lag			
F-statistic	0.230268	Prob. F(1,56)	0.6332
Obs*R-squared	0.257991	Prob. Chi-Square(1)	0.6115
Heteroskedasticity Test: Breusch-Pagan-Godfrey Null Hypothesis: Homoskedasticity			
F-Statistic	0.367489	Prob. F(5,57)	0.8688
Obs*R-Squared	1.967437	Prob. Chi-Square(5)	0.8536
Scaled Explained SS	2.028688	Prob. Chi-Square(5)	0.8452

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Test of Linearity

The study used Ramsey's (1969) regression error specification test to check for model errors. As shown in Table 6, the F-statistic and T-statistic p-values exceed 5%, indicating no specification errors and confirming that the models are well specified.

Table 6: Linearity Test

Ramsey RESET Test			
	Value	**Df**	**Probability**
T-Statistic	0.785078	56	0.4357
F-Statistic	0.616348	(1, 56)	0.4357
Likelihood Ratio	0.689604	1	0.4063

Stability Test

This study employed both the CUSUM and CUSUM of squares tests to assess the model's stability and suitability for decision-making over both short and long-term periods. A model is considered stable if the structural stability of its parameters is confirmed, with the CUSUM and CUSUM of squares plots remaining within the critical 5% threshold. However, if these plots exceed the critical limit, it indicates instability in the parameters. Figures 1 and 2 illustrate the CUSUM and CUSUM of squares plots, respectively. The results from the CUSUM and CUSUM of squares tests confirm that the model's parameters are stable, as evidenced by the plots remaining within the critical limits.

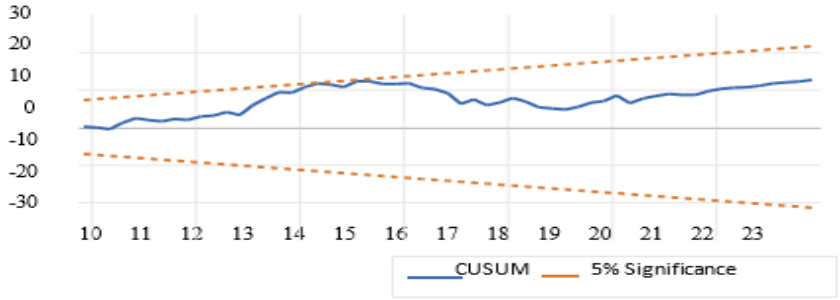

Figure 1: CUSUM Chart

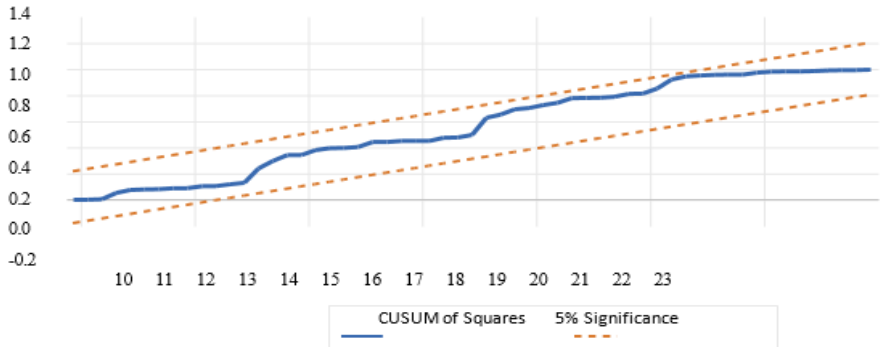

Figure 2: CUSUM Chart

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CONCLUSION

This study uses a quarterly series from 2008 to 2023 to examine the short- and long-run impacts of income, lending interest rates, and deposit interest rates on money demand in Jordan, employing the ARDL model. The unit roots of the variables were tested using the ADF test. Results indicated that, in the first difference, lending and deposit interest rates, along with money demand, were constant, while GDP remained unchanged. The variables exhibit a long-run relationship, as they are cointegrated. It was found that deposit interest rates have a modest positive effect on money demand in the long run, whereas lending interest rates exert a significant negative effect. In the long run, interest rates on loans and deposits influence money demand more than in the short run. The ECM indicates a 3.8% correction for any imbalance from the previous period. Stability of the parameters is confirmed through the CUSUM and CUSUM of squares tests. The study concludes that higher deposit rates do not affect money demand, while higher lending rates do. It recommends that the Central Bank closely monitor commercial banks to ensure competitive loan rates, as excessive lending rates may deter private sector investment. Policymakers should focus on stabilising borrowing costs to maintain liquidity and investment. Enhancing the attractiveness and accessibility of deposit instruments could also strengthen the monetary transmission mechanism. Furthermore, monetary authorities are advised to exercise caution in using interest rate tools, considering their asymmetric effects. The ECM coefficient, indicating a slow adjustment speed of 3.8%, underscores the need for anticipatory policy actions, as changes will take time to fully manifest in monetary aggregates.

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