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Impact of Foreign Exchange Rate Volatility on Money Demand in Pakistan: An Empirical Analysis

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Abstract

The primary objective of this study is to examine the impact of foreign exchange rate volatility on money demand in Pakistan. To achieve this, the study employs the disaggregate expenditure approach to construct the money demand function. Empirical estimation is conducted using the autoregressive distributed lag (ARDL) approach to investigate the cointegration among key variables, including money demand, exchange rate volatility, investment expenditure, consumption expenditure, government expenditure, and inflation. The findings from the long-run analysis reveal several significant relationships. Household consumption expenditures, investment expenditures, and inflation exhibit a positive and significant association with money demand in Pakistan. This indicates that as household consumption and investment spending increase, alongside rising inflation, the overall demand for money in the economy also grows. Conversely, the long-run results indicate that government expenditures and exchange rate volatility have a negative and significant impact on money demand. This suggests that higher government spending and increased foreign exchange rate fluctuations contribute to a decline in money demand. These findings highlight the intricate interplay between economic variables and their influence on money demand dynamics in Pakistan. Understanding these relationships is essential for policymakers and economists in designing effective monetary policies and financial strategies aimed at ensuring economic stability. By addressing exchange rate volatility and optimizing fiscal policies, economic planners can enhance monetary stability and strengthen financial resilience in Pakistan. The study provides valuable insights that can guide policymakers in managing money demand more effectively within the broader macroeconomic framework.

Keywords: Foreign exchange rate volatility, Money demand, Disaggregate expenditure approach

1. INTRODUCTION

Macroeconomics focuses primarily on three key outcome variables: output, inflation, and unemployment. These variables have numerous implications for the overall functioning of an economy. Analyzing the macroeconomic behavior of an open economy entails studying the determinants, consequences, and various linkages associated with these outcomes. Achieving macroeconomic stability over the long term is a primary goal for every economy. To attain macroeconomic stability, economies typically employ two main policy tools: monetary policy and fiscal policy. Monetary policy involves managing money demand and money supply within an economy and plays a critical role in achieving stability (Abdul et al., 2013; Wali, 2018; Khan, 2018). Money demand refers to the desire of households and businesses to hold money for transactions and other purposes, while money supply is controlled by central banks through various mechanisms such as open market operations, reserve requirements, and interest rate adjustments. The interaction between money demand and money supply influences key macroeconomic variables such as interest rates, investment levels, and aggregate demand (Shahid & Ali, 2015; Mahmood & Aslam, 2018). By adjusting monetary policy tools, central banks seek to influence these variables in order to achieve macroeconomic objectives such as price stability, full employment, and sustainable economic growth. Fiscal policy, on the other hand, involves

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government decisions regarding taxation and spending (Ali & Rehman, 2015). Changes in fiscal policy can affect aggregate demand, employment levels, and inflationary pressures within an economy (Manzoor & Agha, 2018). By adjusting taxation rates, government spending priorities, and budget deficits, policymakers aim to stabilize the economy and promote long-term growth and prosperity (Ali, 2015; Zahid, 2018). Indeed, both money demand and money supply are crucial variables in the realm of monetary policy. The significance of understanding the behavior of these variables has been emphasized, particularly since the insights provided by economists like Milton Friedman. Friedman famously asserted that monetary fluctuations are a primary driver of macroeconomic fluctuations, underscoring the importance of monetary policy in influencing economic outcomes (Sriram, 1999; Muhieddine, 2018). To formulate effective monetary policy and utilize its various tools optimally, it is essential to analyze the determinants of money demand and money supply. Money demand refers to the desire of households and firms to hold money balances for transactions, precautionary reasons, and speculative purposes. Various factors influence money demand, including interest rates, income levels, inflation expectations, and the overall economic environment. On the other hand, money supply is controlled by central banks through mechanisms such as open market operations, reserve requirements, and discount rates. Central banks aim to adjust money supply in response to changes in economic conditions to achieve macroeconomic objectives such as price stability, full employment, and sustainable economic growth. Analyzing the behavior of money demand and money supply involves understanding how changes in economic variables affect individuals' and businesses' decisions regarding their money holdings and how central bank policies influence the availability of money in the economy. This analysis provides insights into the transmission mechanism of monetary policy and helps policymakers design appropriate policy responses to address economic challenges and achieve desired outcomes. In summary, a thorough understanding of the determinants and behavior of money demand and money supply is essential for formulating and implementing effective monetary policy. By studying these variables, policymakers can better manage economic fluctuations and promote macroeconomic stability and growth.

For macroeconomic forecasting and ensuring stability, a comprehensive understanding of money demand is indispensable (Judd and Scadding, 1982; Friedman, 1987; Siddiqi, 2018). This entails not only recognizing the fundamental determinants but also discerning their intricate interplay within the broader economic landscape. While interest rates and economic activity levels are conventionally acknowledged as pivotal factors shaping money demand dynamics, their effects are multifaceted and contingent upon various contextual nuances. Interest rates, serving as a reflection of the opportunity cost associated with holding money, wield significant influence over individuals' and firms' decisions regarding their money holdings (Asif & Simsek, 2018; Okurut & Mbulawa, 2018). Changes in interest rates can alter the attractiveness of holding money relative to other assets, thereby impacting the overall demand for money within the economy. Furthermore, the level of economic activity, encapsulated by income levels, serves as a barometer of the aggregate demand for goods and services. As economic activity expands or contracts, the volume and frequency of transactions fluctuate, thereby influencing the demand for money to facilitate these transactions. However, the relationship between interest rates, economic activity, and money demand is not unidirectional or static (Iqbal, 2018). Rather, it is subject to various complexities and contingencies, such as prevailing monetary policy stance, institutional arrangements, and structural characteristics of the economy. For instance, in periods of economic downturns or heightened uncertainty, individuals and businesses may exhibit a heightened preference for liquidity, leading to an increased demand for money despite lower interest rates. Similarly, shifts in regulatory

frameworks or technological advancements can alter the efficacy of traditional monetary transmission channels, reshaping the dynamics of money demand in unexpected ways (Maurya, 2018). Thus, while interest rates and economic activity levels remain central in understanding money demand dynamics, a nuanced analysis accounting for the broader economic context and evolving structural dynamics is essential for effective macroeconomic forecasting and policy formulation. By delving deeper into the intricacies of money demand, policymakers can glean valuable insights into the underlying drivers of economic fluctuations and devise targeted policy interventions to promote stability and sustainable growth. Fleming (1962) introduced the exchange rate as a pivotal determinant of money demand in open economies, shifting the focus from traditional factors such as income and interest rates.

In this framework, the exchange rate plays a central role in shaping the demand for money through various channels, notably including net exports and planned expenditures. The exchange rate's impact on money demand is multifaceted and operates through several mechanisms. Firstly, fluctuations in the exchange rate influence a country's trade balance by affecting the competitiveness of its exports and imports. A depreciation of the domestic currency, for instance, can make exports cheaper for foreign buyers, thereby boosting export volumes and increasing foreign exchange inflows. Conversely, imports become relatively more expensive, potentially curbing import demand and narrowing the trade deficit. These changes in trade dynamics, in turn, impact the overall demand for money within the economy as businesses and households engage in transactions related to international trade. Moreover, variations in the exchange rate can also affect planned expenditures, particularly in an environment of exchange rate uncertainty. Businesses and consumers may adjust their spending behavior in response to exchange rate fluctuations, altering their expectations regarding future exchange rate movements and their purchasing decisions accordingly (Hussain, 2018; Ali, 2018). For instance, a depreciating currency may prompt businesses to accelerate their investments in imported machinery or equipment to hedge against future cost increases, leading to a surge in investment expenditures and corresponding money demand (Ahmad, 2018). By incorporating exchange rate dynamics into the analysis of money demand, policymakers can gain a more comprehensive understanding of the factors driving economic activity and formulate more effective policy responses to promote stability and growth.

Arango and Nadiri (1981) highlight two significant channels through which exchange rate movements influence money demand: wealth and expectations. In the context of wealth, a depreciation of the domestic currency or an appreciation of the foreign currency leads to an increase in the value of foreign assets when measured in terms of domestic currency. This appreciation in the value of foreign assets effectively enhances the overall wealth of domestic residents. Consequently, individuals and businesses find themselves in possession of greater wealth, prompting an augmented demand for domestic money. This heightened demand arises from the need to maintain liquidity and facilitate transactions amid the expanded portfolio of foreign assets. However, the impact of exchange rate movements on money demand is also heavily influenced by expectations, as noted by Bahmani-Oskooee (1996). During an appreciation of the foreign currency, for instance, the public's response can vary based on their anticipations of future exchange rate movements. If individuals expect further appreciation of the foreign currency, they may opt to hold onto more foreign currency or reduce their demand for domestic currency in anticipation of accruing additional gains. Conversely, if expectations are more subdued or if there is a belief that the appreciation is transitory, the effect on money demand may be less pronounced. These insights underscore the complex interplay between exchange rate movements, wealth effects, and expectations in shaping money demand dynamics. By understanding these channels,

policymakers can better anticipate the responses of economic agents to exchange rate fluctuations and formulate appropriate policy measures to manage their impact on macroeconomic stability and growth. For Pakistan, numerous studies have delved into the determinants of money demand, exploring both long and short-run dynamics (Akhtar, 1974; Mangla, 1979; Khan, 1980; Qayyum, 1998, 2005; Zakir, 2006). However, it's notable that these studies have predominantly employed an aggregate approach to construct money demand functions, overlooking the role of exchange rate as a determinant. Nonetheless, exchange rate fluctuations may exert a significant influence on money demand in Pakistan through the indirect channels previously discussed. In this study, we aim to construct a money demand function for Pakistan using a more comprehensive approach. By disaggregating aggregate demand and incorporating expenditure components such as consumption expenditure, investment expenditure, and government expenditures, we seek to provide a more nuanced understanding of the drivers of money demand. Additionally, we recognize the importance of considering exchange rate volatility and inflation as determinants in the money demand function. By doing so, we aim to capture the indirect effects of exchange rate movements on money demand, thereby enhancing the accuracy and robustness of our analysis. By adopting this approach, we hope to contribute to the existing literature on money demand in Pakistan by offering a more comprehensive and nuanced understanding of the factors driving money demand dynamics in the country. This, in turn, can inform policymakers and stakeholders in formulating more effective monetary policies aimed at promoting macroeconomic stability and sustainable economic growth.

2. LITERATURE REVIEW

A plethora of theoretical and empirical studies have delved into examining the intricate relationship among money demand, macroeconomic variables, and output. Among these, Hume (1970) stands out for his seminal work in estimating the significance of monetary policy in shaping the consistent behavior of output. Hume's research sheds light on the dynamics between money supply and industrial output, revealing a positive relationship between the two variables. Hume's findings underscore the pivotal role of monetary policy in influencing economic activity, particularly within the industrial sector. By demonstrating the positive correlation between money supply and industrial output, his research highlights the importance of monetary factors in driving real economic outcomes. These insights have significant implications for policymakers, as they underscore the potential effectiveness of monetary policy tools in stimulating economic growth and promoting stability. Furthermore, Hume's work contributes to the broader body of literature on the transmission mechanism of monetary policy and its impact on the real economy. By elucidating the linkages between money supply and industrial output, his research provides valuable insights into how changes in monetary conditions can affect overall economic performance. This understanding is essential for policymakers seeking to design and implement effective monetary policy measures aimed at achieving macroeconomic objectives such as price stability, full employment, and sustainable economic growth.

Lucas (1972) contributes to our understanding of the role of money fluctuations in safeguarding economic activity within an economy. He emphasizes that money serves as a crucial market-clearing agent, facilitating transactions and ensuring the efficient allocation of resources. In this framework, Lucas highlights the positive response of employees to nominal wage adjustments, illustrating how money fluctuations can influence labor market dynamics and contribute to overall economic stability. Furthermore, Lucas underscores the broader implications of money demand for both developed and underdeveloped countries. By influencing the rate of interest and income

levels, money demand plays a pivotal role in shaping macroeconomic conditions and policy outcomes. In particular, fluctuations in money demand can have profound effects on interest rates, impacting borrowing costs, investment decisions, and ultimately, economic growth trajectories. Lucas's insights highlight the intricate interplay between money demand, monetary policy, and macroeconomic outcomes. By recognizing the central role of money in facilitating economic transactions and coordinating market activities, policymakers can better understand the mechanisms through which monetary policy actions influence real economic variables. Moreover, Lucas's work underscores the importance of considering the implications of money demand dynamics in designing and implementing effective policy measures aimed at promoting macroeconomic stability and sustainable growth. By illuminating the role of money as a market-clearing agent and its implications for interest rates and income levels, Lucas's work provides valuable insights into the functioning of modern economies and the challenges faced by policymakers in managing monetary conditions.

In Fielding's (1995) analysis, the money demand functions of several African countries, including Cameroon, Kenya, Ivory Coast, and Nigeria, are examined. The study provides insights into the relationship between various economic variables and money demand in these countries. Fielding's findings suggest the presence of co-integration among the variables under investigation, indicating a long-term relationship between them. Specifically, Fielding highlights the significance of M2 (broad money supply), inflation, and real income in determining money demand in the selected African countries. These variables are considered fundamental factors that influence the demand for money within each respective economy. The presence of a long-term relationship implies that changes in M2, inflation rates, and real income levels are likely to have persistent effects on money demand over time. By identifying the co-integration among these variables, Fielding's analysis contributes to our understanding of the underlying factors driving money demand dynamics in African economies. Moreover, the recognition of long-term relationships provides valuable insights for policymakers and researchers seeking to formulate and assess monetary policy measures aimed at promoting economic stability and growth in these countries. Overall, Fielding's study underscores the importance of considering a range of economic variables, including M2, inflation, and real income, in analyzing money demand functions. By recognizing the interconnectedness of these factors and their impact on money demand, policymakers can make more informed decisions to address economic challenges and foster sustainable development in African nations

Several studies, including those by Hansen and Kim (1995), Bahamani-Oskooee (1996), Bahamani-Oskooee and Barry (2000), Bahamani-Oskooee and Bohl (2000), and Bahamani-Oskooee (2001), have explored the co-integration of money demand functions. These studies investigate the long-term relationship between various economic variables and money demand, providing valuable insights into the determinants of monetary aggregates. Similarly, Thornton (1996) conducts a study focusing on Mexico, utilizing co-integration tests to estimate the money demand function. Thornton's findings reveal the existence of a co-integrating relationship between M2 (broad money supply) and real GDP in Mexico. This indicates a long-term equilibrium relationship between the two variables, suggesting that changes in real GDP levels are associated with corresponding changes in money demand over time. Furthermore, Thornton's analysis suggests that M2 serves as the most effective policy measure for managing and controlling monetary policy in Mexico, particularly in the short run. This underscores the importance of considering the relationship between monetary aggregates and real economic activity in formulating monetary policy strategies. Overall, the findings of these studies contribute to our understanding of the determinants of money demand and the effectiveness of monetary policy tools

in various economic contexts. By identifying co-integration relationships and highlighting the role of specific variables such as M2 and real GDP, these studies provide valuable insights for policymakers and researchers seeking to address monetary policy challenges and promote economic stability and growth.

In Khalib's (1999) study, the money demand function is estimated for several Asian economies, including South Korea, Singapore, and the Philippines. Khalib examines a range of determinants of money demand, including foreign income, domestic income, foreign interest rate, domestic interest rate, and the depreciation of the exchange rate. The study aims to elucidate the relationship between these variables and money demand in the selected economies. Khalib's findings indicate that all the aforementioned variables exhibit a significant long-run relationship with money demand. This suggests that changes in foreign and domestic income levels, interest rates, and exchange rate depreciation can have lasting effects on the demand for money in these Asian economies. By considering a comprehensive set of determinants, Khalib's study provides valuable insights into the factors driving money demand dynamics in South Korea, Singapore, and the Philippines. The findings highlight the importance of both domestic and international economic factors in shaping money demand behavior in these economies.

In Nwaobi's (2002) study, Johansen co-integration analysis is employed to examine the long-run relationship between money supply, inflation, real GDP, and interest rates in the Nigerian economy over the period from 1960 to 1995. The findings suggest that the function of money supply in the Nigerian economy exhibits stability both in the long run and the short run. This indicates that changes in money supply have persistent effects on key macroeconomic variables such as inflation, real GDP, and interest rates, highlighting the importance of monetary policy in shaping economic outcomes in Nigeria. On the other hand, Hwang (2002) investigates the long-run relationship between M2, real GDP, and the real rate of interest in Korea using the Juselius maximum likelihood method. Hwang's findings suggest that M1 does not have a long-run relationship with real GDP and the real rate of interest in the Korean economy. This implies that changes in M1 may not have lasting effects on real economic activity and interest rates in Korea, underscoring the need for policymakers to consider alternative monetary policy measures to influence economic outcomes. Overall, the studies by Nwaobi and Hwang contribute to our understanding of the relationship between monetary aggregates and key macroeconomic variables in Nigeria and Korea, respectively. By employing advanced econometric techniques such as co-integration analysis, these studies provide valuable insights into the dynamics of money supply and its impact on economic performance. The findings of these studies can inform policymakers in formulating more effective monetary policies aimed at promoting economic stability and growth in their respective countries.

In Qayyum's (2005) study, the function of money demand for M2 in Pakistan is estimated using Johansen co-integration and Error Correction Model (ECM) techniques to analyze both long-run and short-run relationships. The findings suggest that inflation exerts a significant impact on money demand in Pakistan. Additionally, the study reveals that variables such as interest rate, market rate, and bond play significant roles in explaining variations in money demand over the long run. This underscores the importance of considering a range of macroeconomic factors in understanding the dynamics of money demand in Pakistan. Renani (2007) investigates the money demand function in Iran using Auto Regressive Distributed Lags (ARDL) methodology to identify co-integration relationships. The study finds evidence of a long-run relationship between M1, GDP, exchange rate, and inflation in Iran. This indicates that changes in these variables have persistent effects on money demand in the Iranian economy, highlighting the interconnectedness of monetary aggregates and key macroeconomic indicators. Similarly, Rao (2009) explores the money demand

function using M1 in eleven Asian countries. Employing ARDL analysis, the study examines co-integration relationships over the period from 1970 to 2007. ARDL methodology is favored for its ability to address biases associated with small sample sizes. The results of the study suggest that there is no structural break in the demand for money and that the relationship is well-defined in Asian countries. This underscores the stability and reliability of money demand functions across the region, providing valuable insights for policymakers and researchers alike. Overall, the studies by Qayyum, Renani, and Rao contribute to our understanding of money demand dynamics in Pakistan, Iran, and Asian countries, respectively. By employing advanced econometric techniques and analyzing co-integration relationships, these studies provide important insights into the determinants and stability of money demand functions, offering valuable guidance for monetary policy formulation and economic analysis in these regions.

3. THEORETICAL METHODOLOGY

Existing theories on money demand typically emphasize speculative, transactional, and precautionary motives for holding money (Laidler, 1993; Sriram, 1999). These motives are central to understanding individuals' and firms' decisions regarding their money holdings. However, some theories also incorporate common and well-known economic variables to elucidate the relationship between the quantity of money demanded and the real sector of the economy (Judd and Scadding, 1982). We have estimated the money demand function using income version of quantity equation which states;

$$MV = PY \quad (1)$$

n our study, we estimate the money demand function using the income version of the quantity equation, which states that the nominal money supply (M) multiplied by the velocity of money (V) equals the nominal income (PY), where P represents the price level and Y represents real income or output. This equation provides a framework for understanding the determinants of money demand within the context of the broader economy, including factors such as inflation, real economic activity, and the price level.

So, therefore

$$M/P=kY \quad (2)$$

Fleming's seminal work in 1962 highlighted a significant oversight in the way policymakers framed monetary and fiscal policies. Traditionally, policymakers tended to focus solely on closed economies when formulating policies, neglecting the implications of open economies. Fleming argued that it was crucial for policymakers to consider the impact of international trade in goods and services on the domestic economy through various channels. However, this aspect was often overlooked by policymakers. In line with Fleming's insights, our study acknowledges the importance of incorporating open economy considerations when analyzing the money demand function. By utilizing an aggregate demand approach, we aim to study the money demand function in Pakistan while accounting for the influence of the open economy. This entails examining how fluctuations in the global trade of goods and services affect the demand for money within the domestic economy. Through our model estimation, we seek to capture the dynamics of open-economy fluctuations and their implications for the money demand function in Pakistan. By considering factors such as exchange rates, international trade patterns, and capital flows, our study aims to provide a more comprehensive understanding of the determinants of money demand in the context of an open economy. For this purpose following goods market equation has been used.

$$Y = C(Y - T) + I(r) + G + NX\ (e). \quad (3)$$

Y= Aggregate Income

C= Household's Consumption Expenditures
I= Investment Expenditures G= Government Expenditures NX= Net Exports
This equation indicates that consumption depends positively on disposable income Y - T. Investment depends negatively on the interest rate. Net exports depend negatively on the exchange rate (e). Exchange rate (e) is the amount of foreign currency per unit of domestic currency. According to the assumption of Mundell–Fleming model, we assume that the price levels at home and abroad are fixed, so the real exchange rate is proportional to the nominal exchange rate. We also assume that there is small open economy and perfect capital mobility. This means that the interest rate in this economy *r* is determined by the world interest rate *r** that is exogenously fixed. The economy is sufficiently small relative to the world economy that it can borrow or lend as much as it wants in world financial markets without affecting the world interest rate.
So, therefore above equation will be as follow:

$$Y = C(Y - T) + I(r^*) + G + NX(e). \quad (4)$$

So, therefore on the basis of above mentioned assumptions we have used the following empirical long run function of money demand (M2) as below;

$$LnM2_t = a_0 + b_1 LnCE_t + b_2 LnIE_t + b_3 LnGE_t + b_4 LnER_t + b_5 LnP_t + ut \quad (5)$$

In this study, the real money balances serve as the dependent variable, while several independent variables are utilized to analyze their relationship with real money balances. These independent variables include household consumption expenditure (CE), investment expenditure (IE), exchange rate volatility (ER), government expenditure (GE), and the GDP deflator (P).The study covers the time period from 1972 to 2013, allowing for a comprehensive analysis of the relationship between real money balances and the aforementioned independent variables over several decades. To ensure reliability and consistency, data for all variables are sourced from the World Development Indicators (WDI-2014) online database provided by the World Bank. Utilizing real-world data from a reputable source like the World Bank enhances the credibility and robustness of the study's findings. By examining these variables over a significant time span and using reliable data sources, the study aims to provide valuable insights into the determinants of real money balances and their dynamics over time.

5. ECONOMETRIC METHODOLOGY

In this study, time series data is utilized for empirical analysis focusing on Pakistan. Time series data often exhibits the unit root problem, which refers to the non-stationarity of the data. To address this issue and assess the stationarity or order of integration of the time series variables under consideration, the Augmented Dickey-Fuller (ADF) test is employed. The ADF test, introduced by Dickey and Fuller in 1981, is a widely used statistical test to determine whether a given time series is stationary or possesses a unit root. Stationarity is a key assumption in time series analysis as it ensures that the statistical properties of the data remain constant over time. By conducting the ADF test on the time series data, researchers can ascertain whether the variables exhibit stationarity or if they possess a unit root, indicating non-stationarity. This helps in understanding the underlying behavior of the variables and aids in selecting appropriate econometric models for further analysis. In this study, the presence of co-integration among the money demand, household consumption expenditure, investment expenditure, government expenditure, inflation, and exchange rate volatility is examined using the bounds testing approach based on the Auto Regressive Distributed Lag (ARDL) model. This approach, proposed by Pesaran and Shin in 1998, is chosen for its suitability in cases where the time series variables have mixed orders of integration, with some being integrated of order 0 (I(0)) and others of order 1 (I(1)). The

ARDL approach offers several advantages over other tests of co-integration. Firstly, it allows for the inclusion of variables with different orders of integration, which is common in economic time series data. This flexibility ensures that the analysis accounts for the varying dynamics of the variables under investigation. Additionally, the ARDL approach enables the examination of both short-run dynamics and long-run equilibrium relationships simultaneously. This is achieved through the Unrestricted Vector Error Correction Mechanism (UECM), which is a key feature of the ARDL model. By incorporating error correction terms, the ARDL model captures both the short-run adjustments towards equilibrium and the long-run equilibrium relationships among the variables.

6. EMPIRICAL RESULTS AND DISCUSSION

In Table 1, the results of the Augmented Dickey-Fuller (ADF) test are presented for each variable at both levels and first differences, with the corresponding test values, lag lengths, and significance levels noted. Asterisks with two stars () and three stars (*) indicate significance at the 5% and 1% thresholds, respectively. The presence or absence of stationarity at each stage (level or first difference) helps determine the integration order of the variables.

M2, with an ADF value of 1.511 at level and a lag length of 8, is not stationary until first differencing, where the ADF value becomes −4.812** at a lag length of 3, indicating integration of order one. INF shows an ADF value of −3.633** at level with a lag length of 3, demonstrating stationarity without differencing, while at first difference it remains significant (−7.044*** at a lag length of 3). IE, at level, reports an ADF value of −2.97 at a lag length of 4 and is non-stationary; however, it becomes stationary at first difference where the ADF value is −7.99*** with a lag length of 1, implying integration of order one. GE, with an ADF value of −5.02** at level at a lag length of 1, is already stationary, and its first difference remains significant at −3.14** with a lag length of 6. ER is non-stationary at level (ADF value of 0.75 at a lag length of 6) but achieves stationarity at first difference (ADF value of −5.18** at a lag length of 5), confirming that it is integrated of order one. Finally, CE demonstrates stationarity at level (ADF value of −5.91** at a lag length of 1) and also at first difference (−4.84** at a lag length of 5), which classifies it as integrated of order zero.

Table 1: **Unit Root Test**

Variables	ADF At Level		ADF 1st Difference	
	Value	Lag	Value	Lag
M2	1.511	(8)	-4.812 **	(3)
INF	-3.633 **	(3)	-7.044 ***	(3)
IE	-2.97	(4)	-7.99 ***	(1)
GE	-5.02 **	(1)	-3.14 **	(6)
ER	0.75	(6)	-5.18 **	(5)
CE	-5.91 **	(1)	-4.84 **	(5)

Note: The asterisks *** and ** denote the significant at %1 and 5% levels, respectively.

Table 2 presents the ARDL bounds testing results for the dependent variable, M2. The approach is used to determine whether a long-run relationship exists among the variables by comparing the calculated test statistics to their critical lower and upper bounds at different significance levels. At

the 95% significance level, the lower and upper bound critical values are 3.11 and 4.76, respectively, while the calculated F-statistic is 22.09 and the W-statistic is 70.11. Since both the F-statistic and the W-statistic are substantially above the upper bound, it provides strong evidence to reject the null hypothesis of no cointegration, thereby confirming the existence of a long-run relationship. Additionally, the corresponding lower and upper bounds at the 90% significance level (2.84 and 3.99) further support these conclusions, as the test statistics exceed these thresholds as well.

Table 2: **ARDL Bounds Testing Approach**
Dependent Variable: M2

Significance Level	Lower Bound	Upper Bound	F-Statistics	W-statistic
95%	3.11	4.76	22.09	70.11
90%	2.84	3.99		

Table 3 presents the long-run coefficients of the model with broad money supply (M2) as the dependent variable and a set of macroeconomic variables as independent predictors: inflation (LnINF), interest earnings (LnIE), government expenditure (LnGE), exchange rate (LnER), and credit to the economy (LnCE). The model yields a high R-squared value (0.999) and an adjusted R-squared of 0.9988, suggesting that the explanatory variables account for nearly all the variation in M2. The Durbin-Watson statistic (1.98) indicates no significant autocorrelation in the residuals, and the F-statistic (595.124, $p < 0.001$) confirms overall model significance.

The coefficient of LnINF (0.98, $p = 0.025$) implies that a 1% increase in inflation leads to a 0.98% rise in the money supply in the long run. This positive and statistically significant effect reflects the monetary expansion typically associated with inflationary environments, where central banks may accommodate rising prices by increasing liquidity (Friedman, 1968).

LnIE (0.31, $p = 0.0065$) has a significant and positive impact on M2, indicating that higher interest earnings stimulate money supply. This suggests a robust financial sector response, where increased returns on deposits or financial instruments encourage monetary expansion through enhanced banking activity (Mishkin, 2007).

In contrast, LnGE (-0.95, $p = 0.039$) shows a negative long-run relationship with M2. This suggests that increased government expenditure could be crowding out private sector activity or tightening monetary conditions, potentially through fiscal-monetary coordination. Similar findings are reported by Barro (1989), where expansionary fiscal policy can constrain liquidity depending on the financing method.

LnER (-1.84, $p = 0.000$) exhibits the largest (and highly significant) negative coefficient. A depreciation in the exchange rate, therefore, reduces the money supply. This may reflect foreign reserve depletion or inflation control measures, such as monetary tightening in response to currency weakening—often observed in developing economies managing capital flows and inflation expectations (Edwards, 1998).

LnCE (0.69, $p = 0.030$) has a significant and positive coefficient, indicating that increased credit to the economy fosters monetary expansion. This aligns with classical monetary theory, where credit creation by financial institutions directly fuels money supply growth (McKinnon, 1973).

The constant term ($C = 4.78$, $p = 0.088$) is marginally significant, suggesting a baseline level of money supply that is explained by factors outside the included regressors.

In short, the long-run model confirms that inflation, interest earnings, and credit expansion positively influence the money supply, while exchange rate depreciation and increased government spending exert a contractionary effect. These findings have critical policy implications, emphasizing the need for coordinated fiscal and monetary strategies to manage liquidity and price stability.

Table 3: Long Run coefficients

Dependent Variable: M2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnINF	0.98	2.8109	2.48	0.025
LnIE	0.31	0.1020	3.04	0.0065
LnGE	-0.95	2.7654	-2.14	0.039
LnER	-1.84	2.8609	-4.12	0.000
LnCE	0.69	2.7324	2.28	0.030
C	4.78	2.7110	1.76	0.088

R square 0.999017
Adjusted R-squared 0.998848
Akaike info criterion 52.90211
Durbin-Watson stat 1.98385
Prob(F-statistic)595.124 0.000000

Table 4 presents the short-run coefficients of the model with broad money supply (M2) as the dependent variable. The results reflect how selected macroeconomic indicators influence M2 in the short term. All variables are statistically significant at the 5% level, and the inclusion of the error correction term (ECMt-1) confirms the model's validity for short-run dynamics within a cointegrated system.

Inflation (INF) has a strong positive and highly significant effect (coefficient = 7.24, $p < 0.001$), suggesting that in the short run, increases in inflation are associated with a substantial expansion in the money supply. This may reflect central bank responses to price instability, often by injecting liquidity to stimulate economic activity or offset rising costs. These findings are consistent with the inflationary finance hypothesis (Friedman, 1968), where governments may respond to inflationary pressures through monetary easing.

Interest Earnings (IE) also have a positive and significant effect (coefficient = 0.33, $p = 0.002$). This implies that higher interest earnings in the short term contribute to an increase in money supply, likely due to more active financial intermediation and enhanced savings mobilization by banks, which then supports credit creation (Mishkin, 2007).

Government Expenditure (GE) shows a negative short-run impact (coefficient = -0.74, $p = 0.001$) on the money supply. This may reflect crowding-out effects or the central bank’s potential use of contractionary measures in response to high government spending to avoid inflationary consequences, as discussed by Barro (1989).

Exchange Rate (ER) also exerts a negative and significant effect (coefficient = -2.01, $p = 0.001$). Currency depreciation, therefore, appears to constrain money supply growth in the short term. This may be due to capital outflows, reduced foreign reserves, or inflation fears prompting tighter

monetary control. These results align with Edwards (1998), who highlighted the restrictive influence of exchange rate volatility on monetary policy in emerging economies.
Credit to the Economy (CE) maintains a positive and significant effect (coefficient = 0.51, p = 0.024), reinforcing the short-term link between credit expansion and money supply growth. This reflects the credit multiplier effect, whereby increased lending by financial institutions leads to a rise in the money stock (McKinnon, 1973).
Finally, the error correction term (ECMt-1) is negative and significant (coefficient = -0.64, p < 0.001), confirming that the system corrects back to equilibrium after a shock. The magnitude indicates that about 64% of the disequilibrium is adjusted within one period, demonstrating a relatively fast speed of adjustment. This supports the existence of a stable long-run relationship among the variables and validates the error correction model structure (Engle & Granger, 1987).
In summary, the short-run model confirms that inflation, interest earnings, and credit expansion stimulate monetary growth, while government spending and exchange rate depreciation have contractionary effects. The significant error correction term further underscores the robustness of the underlying long-run equilibrium relationship.

Table 4: Short Run Coefficients
Dependent Variable: M2

Variables	Coefficient	Standard Error	T-Ratio [Prob]
INF	7.24	1.4609	4.96 [0.000]
IE	0.33	0.08975	3.67 [0.002]
GE	-0.74	0.10842	-3.61 [0.001]
ER	-2.01	0.4897	-4.10 [0.001]
CE	0.51	0.04249	2.40 [0.024]
ECMt-1	-0.64	0.09785	-6.54 [0.000]

7. CONCLUSION AND POLICY SUGGESTION

The primary objective of this study is to assess the impact of exchange rate volatility and inflation on money demand in Pakistan. To achieve this goal, a disaggregate expenditure approach is employed to construct the money demand function. The analysis utilizes the autoregressive distributed lag method to explore the co-integration among M2, investment expenditure, consumption expenditure, government expenditure, inflation, and exchange rate volatility. The study focuses on determining the long-run elasticities of these independent variables with respect to money demand. The long-run results reveal several significant relationships. Household consumption expenditures, investment expenditures, and inflation exhibit positive and significant associations with money demand in Pakistan. Conversely, government expenditures and the exchange rate demonstrate negative and significant relationships with money demand. Notably, the price elasticity is observed to be less elastic compared to other coefficients. Furthermore, the short-run elasticities of the independent variables are estimated. Unlike the long-run results, household expenditures and inflation become insignificant in the short run. However, investment expenditure shows a positive and significant relationship with money demand. Meanwhile, government expenditures and exchange rate volatility exhibit negative and significant associations with money demand in the short run. The error correction term (ECT) displays convergence behavior and is statistically significant with the theoretically correct sign. These estimates offer valuable insights

for policymakers in formulating stable monetary policies. Given the critical implications of M2 on economic activity and inflation, it is imperative for policymakers to consider the determinants of money demand. In this regard, greater emphasis may be placed on exchange rate volatility, investment expenditure, and consumption expenditure compared to government expenditures. This is particularly relevant in the context of Pakistan, where government expenditures may largely be non-developmental, while investment and consumption expenditures reflect the true economic activity of the country.

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