Ilkogretim Online - Elementary Education Online, 2021; Vol 20 (Issue 5): pp. 6744-6759
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2021.05.763

GOVERNMENT EXPENDITURES, INFLATION AND DEMAND FOR MONEY IN PAKISTAN: A COINTEGRATION APPROACH

Abdul Ghaffar, PhD Scholar, School of Statistics, Dongbei University of Finanace and Economics, Dalian, China, abdulghaffar884@gmail.com
Wasim Abbas Shaheen, Assistant Professor, Quaid-i-Azam School of Management Sciences, Quaid-i-Azam University Islsamabad, Pakistan, wasim@qau.edu.pk
Samina Begum, Assistant Professor, Management Science Department, Abbottabad University of Science and Technology, Havelian, KPK, Pakistan, saminabegum@aust.edu.pk
Rabia Mushtaq, Assistant Professor, Quaid-i-Azam School of Management Sciences, Quaid-I-Azam University, Islamabad, Pakistan, mrabia@qau.edu.pk
Abida Ellahi, Assistant Professor, Management Science Department, Abbottabad University of Science and Technology, Havelian, KPK, Pakistan, abia.ell@gmail.com

Abstract- The policies depend on the capacity to adjust money provide to its demand in order to prevent monetary disturbances from affecting real output. Due to the vital role of money demand in macroeconomic analysis, i.e. formation and transmission of monetary policy. The past several decades have witnessed considerable empirical research on this factor in developed and developing countries. Limited studies have assessed the impact of government expenditures and inflation on the demand for money in Pakistan. In the present study, the main focus is to determine the long and short-run relationship between government expenditures, inflation, and demand for money in Pakistan. To measure this relationship, time series data have been taken over the period 1980-2018 from World Development Indicators (WDI, 2019). The ADF test is used to check the stationarity of data and found that all variables are I(1). The Trace value and Eigenvalue statistics show that there exist two Eigenvectors. The empirical results show that government expenditures, inflation, household final consumption expenditures, foreign direct investment, and export have a positive and significant relationship with demand for money. Error Correction Model (ECM) is used to measure the short-run effect. The empirical results show that there is no issue of heteroscedasticity (Godfrey, Glejser, ARCH, and White), normality (Jarque-Bera), serial correlation (Breush-Godfrey), and model specification (Ramsey RESET) among the residuals. The CUSUM and CUSUMQ plots are used to check the stability of parameters of the model, and plots by using our empirical data show that the parameters are stable.

Keywords: Demand for money, Inflation, Government expenditure, Disaggregate approach, Co-integration, Pakistan

I. INTRODUCTION

In the context of macroeconomics, the study of the behavior of demand and claim for money in a country's economy has an integral role. The researchers and policymakers know that it is very significant for planning and making a monetary policy**.** The major area is to evaluate the tendency of money demand with its features. Different studies demonstrate different features of money demand functions, a number of them are discussed here. For the successful implementation of the monetary policy and to attain its target, it is vital to determine and establish all factors which change or influence the money demand. The managed and stable money demand purpose is requisite for the analysis of policy and forecasting (Judd & Scadding, 1982). It is examined that actual money balances, genuine income, and authentic interest rate have a steady long-run relationship (Friedman, 1956)**.** In various countries, efforts have been made to search out the factors of demand for money in the long run theoretically as well as empirically. Meanwhile, different researches have been conducted to estimate the money demand function in Pakistan. The determinants of the money demand function are also discussed in Pakistan. The empirical judgment of demand for money over time 1951-70 has been investigated, results show that the primary determinant of demand for money is income. The rate of interest and inflation were also found to be significant factors (Abe et al., 1975; Akhtar, 1974) The empirical and theoretical approximation of the money demand function was also discussed in detail by using permanent and continuous income instead of nominal income (Mangla, 1979). The factors of demand for money and association, between inflation permanent income, expectation, and demand for money for the developing countries were found to be significant (Khan, 1980).

Different researchers studied the demand for money in other countries and as well as in Pakistan such as, (Nisar & Aslam, 1983; Qayyum, 1998) utilized different alternate specifications to approximate the money demand purpose. The stability of the approximated money demand function is investigated by (Ahmad & Khan, 1990) and established that generally, the M2 function is steady. A small number of authors overlook the time-series properties of related variables like (Hossain & Ali., 1994; Khan & Ali, 1997; Qayyum, 1998; Qayyum & Nishat, 2001). The strong conclusion about the influence of the expenditure of government on economic performance does not automatically create by the economic theory. Many economists would opine that there are many situations in which grass root levels of government expenditure would increase economic growth and other circumstances in which a higher level of government expenses would be quite desirable. If there is very little economic growth, then government spending is zero (Mitchell, 2005). There are long and short term features of the money demand function. The development of production related to the long-term features of money demand. This means that enlarged issue of money which was stable with price stability may exclusively be gained in the long run if it was tracking the growth of output. In short, a declining rate of money flow may become the reason for the money demand to increase irrespective of the movements in real production. However, the continuing growth in money supply, ignoring the trends of production, leads to the stronger inflator's pressures. The factors of real money are real GDP, GDP deflator, and exchange rate. Using these factors, the stability of demand for money was checked for Pakistan (Anwar & Asghar, 2012).

The researcher has mostly used different co-integration techniques to approximation the money demand function in Pakistan such as (Qayyum, 2005). The real GNP/GDP is considered as a single measure of aggregate demand variable. Different components have different effects. So, the aggregate demand variable (real income) is disaggregated into the expenditure components such as consumption expenditure, government expenditure, export, and investment expenditure (Abdullah et al., 2013). The rest of the article is summarized as, Section 2 deals with the relevant literature, the models and estimation methods are discussed in section 3 while empirical results of the specified model presented in section 4. Finally, the summary of the research article and conclusion are discussed in section 5.

II. LITERATURE REVIEW

In the literature, many studies exist in which the long-run relationship linking demand for money and its determinant. The stability is also analyzed. Many studies used the co-integration technique, and some used the “autoregressive distributive lag model” (ARDL) approach to guess the relationship and to check the stability.

Akhtar (1974) investigat the function of demand for money for the last two decades in Pakistan. The study supported the real income as the key determinants of money demand. The interest rate, as well as assets, were found to be significant. However, the price-change rate did not influence the demand for real money. The ratio of investment/income and the industrial yield index supported in consistent way to demand money in Pakistan. Mangla (1979) discussed the issues in the theoretical and observed estimation of money demand function in Pakistan. He used permanent income instead of the income as an argument for the money demand function. Bahmani-Oskooee and Shabsigh (1996) discussed the stability of $M1$ and $M2$ real money demand in Japan. The quarterly data over the current floating exchange rate has been taken over the time 1973-Q1 to 1990-QIV and used the Johansen-Juselius co-integration technique to determine the relationship. For estimation four lags are included in the model, and the exchange rate of Yen must be included for the stability of $M2$ (but not $M1$). Although the results were depending upon the selection of lags, if the effective exchange rate was included in the cointegrating space, then there was evidence that $M2$ has a more cointegrating vector as compared to $M1$.

Thornton (1996) discussed the long-run money demand in Mexico, depending upon broad and narrow definition for the time 1980:Q1−1994:Q1. For empirical estimation, he used the “cointegration and Granger-causality” test. The result indicates that the real GDP and real export were cointegrated in Mexico. The positive and significant Granger-causal relationship exists from export to economic growth. Price and Nasim (1999) fitted a model of inflation and money demand using co-integration. They identified a clear money demand correlation in which both money demand and PPP work as a long-run attractor for the consumer price index. Bahmani-Oskooee and Barry (2000) analyzed the market-oriented time series data for the stability of the money demand in Russia. The long-run demand for money was the

key interest of the study. It was the first time that market-oriented data was investigated for the demand for money in the region. Also, the unique techniques of CUSUM and CUSUMSQ were used to check the stability of the model and parameters on the data.

Bahmani-Oskooee and Bohl (2000) studied the stability of the demand for money M3 and monetary unification in Germany. Quarterly data from Germany was collected to test the M3 stability for money demand. The well-known methodology of CUSUM and CUSUMSQ was applied through cointegration and error correction models. Some instability was found in the demand function of M3 money. Haghighat (2011) discussed the empirical study of money demand and its stability in Iran. Johansen-Juselius cointegration technique was used to determine the long-run relationship (equilibrium) between money demand and its factors such as inflation rate, exchange rate, and real income. To check the stability of the money demand function rolling regression procedure is also used. Nchor and Adamec (2016) examined the demand for money and its stability in Ghana. Its found that the variables are non-stationary and integrated. So, they apply the "Error Correction Model" (ECM) to investigate the factors that affect the real money aggregate in Ghana from 1990 to 2014. They consider two variables M1, M2, and estimate the results. The estimated results show that GDP affects the demand for money in the long run, but in the short-run interest rate affect the demand for money.

Bahmani-Oskooee and Baek (2017) considered the money demand function for Korea and includes two measures monetary uncertainty and output uncertainty based on GARCH modeling. From empirical results, it has shown that both measures influence the demand for money in Korea significantly. However, the output uncertainty has an unfavorable effect on the demand for money in Korea in the long run. Actually, including these two uncertainty measures does not affect the stability of the money demand function in Korea. Bahmani-Oskooee and Nayeri (2018) use a nonlinear model for a new policy uncertainty measure. The result showed that this measure has a significant long-run asymmetric effect on the demand for money in Australia. Because of this new nonlinear model has an extremely high projecting power. Bahmani-Oskooee and Maki-Nayeri (2019) studied the economic uncertainty and its impact on demand for money in the U.S.A. Form empirical results they show that policy uncertainty had no long-run effect when using linear money demand while when using nonlinear model policy uncertainty induce the public to hold less money in the long run. Bahmani-Oskooee et al. (2019) studied the impact of the exchange rate on the demand for money in eight Asian countries using the linear Autoregressive Distributed Lag (ARDL) approach. When using the linear ARDL approach, the results show that in five countries exchange rate had no significant long-run effect while using the nonlinear ARDL approach then they had an important effect on demand for money in India, Korea, Singapore, Indonesia, and the Philippines, which supports the asymmetric effect of the exchange rate. There was also evidence of asymmetric effect in the short run.

III. THE MODELS AND ESTIMATION METHODS

Data Source

To estimate the model and its appropriateness, the data of included variables like real money, general government final consumption expenditure, consumer price index, household final consumption expenditure, foreign direct investment, and export of goods and services are taken from World Development Indicator (2019), World Bank. The annual time series data from the period 1980-2015 has been taken from WDI (2019).

Model Specification

The derived money demand function using the income version of the quantity equation is given as:

$$M * V = P * Y \tag{1}$$

Considering the velocity of income $V = \frac{1}{k}$ as a constant and Y is aggregate demand. So, the equation becomes:

$$\left(\frac{M}{P}\right)^d = kY \quad (2)$$

It is supposed that the supply and the demand for real money balance are equal, then:

$$\left(\frac{M}{P}\right)^d = \frac{M}{P} \quad (3)$$

Therefore, equation (3.3) becomes:

$$\frac{M}{P} = kY \quad (4)$$

Abdullah et. al. (2013) disaggregate the output into its four-expenditure component as:

$$Y = C + I + G + (X - M) \quad (5)$$

Using this approach, we disaggregate the aggregate demand into its expenditure component (government expenditure, household final consumption expenditure, and export). The other determinants of real money are not included in the model specified by Abdullah et. al. (2013). The focus of the present study is to find the association of real money with its disaggregated component and determinants. Therefore, the final functional form of the model is given as:

$$LRM_t = f(GGFCE_t, HFCE_t, LCPI_t, FDI_t, LEXP_t) \quad (6)$$

Where LRM_t = Log of Real Money and Real Money= $\frac{BM}{CPI}$

$GGFCE_t$ = General Government Final Consumption Expenditure (Annual Growth in %)

$HFCE_t$ = Household Final Consumption Expenditure (% of GDP)

$LCPI_t$ = Log of Consumer Price Index (2010=100)

FDI_t = Foreign Direct Investment, net inflows (% of GDP)

$LEXP_t$ = Log of Exports of goods and services (constant LCU)

Econometric Methodology

To perform any empirical estimation, the first step is to check the stationarity of the data individually. In general, the time-series data of macroeconomic variables were found to be non-stationary. If the series are non-stationary then the usual "ordinary least square" (OLS) model does not give appropriate results. If the mean, variance, and covariance of the series are constant overtime period, then it is considered a stationary series.

For empirical analysis the Econometric model is as:

$$LRM_t = \alpha_0 + \alpha_1 GGFCE_t + \alpha_2 HFCE_t + \alpha_3 LCPI_t + \alpha_4 FDI_t + \alpha_5 LEXP_t + \varepsilon_t \quad (7)$$

Unit Root

The main concern of empirical analysis is to identify either the variables included in the analysis are stationary or non-stationary by applying the unit root tests. The unit root test allows researchers to differentiate between the difference stationary and trend stationary processes. The Augmented Dickey-fuller (ADF) test was used to check the unit root of the series (Dickey and Fuller; 1979, 1981). The null hypothesis is that the series has a unit root. The number of lags for estimation is selected base on "Schwarz Information Criteria" (SIC). In the present study ADF test is used by including constant only and

constant with the trend is also included. Let $Z_1, Z_2, \dots Z_n$ is a given observed time series then ADF consider three differential form of autoregressive equations to detect the existence of unit root as follows:

$$\Delta Z_t = \begin{cases} \delta Z_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Z_{t-i} + \varepsilon_t \\ \beta_0 + \delta Z_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Z_{t-i} + \varepsilon_t \\ \beta_0 + \beta_1 t + \delta Z_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Z_{t-i} + \varepsilon_t \end{cases}$$

Where

Z_t is individual variable observed at time period t,

$\Delta Z_t = Z_{t-1} - Z_t$, ε_t is an error term.

β_0 is a constant term called drift.

β_1 is a coefficient on-time trends.

δ is the coefficient presenting process root, i.e. the focus of testing.

m is the lag order of the first difference autoregressive process.

ε_t indicates the error term.

Johansen Co-integration

In Econometrics, two or more time series variable has a statistical property named as co-integration. If all the variables are integrated of order 1 and the linear combination of the variable is integrated of I_0, then the variables are said to be co-integrated. To check the co-integration, Engle and Granger (1987) introduced two steps estimation for only single co-integrating vector. A new test for cointegration was introduced by Johansen and Juselius (1990) which allow more than one co-integrating relationship. This test is applicable only when the sample size is large. If the sample size is tiny, then consequences will not reliable. In this situation used Autoregressive Distributed Lags approach. For finding the cointegrating vector in Vector Autoregressive (VAR) model Johansen test is used which is based on the likelihood ratio test. The Vector Autoregressive (VAR) can be written as:

$$Z_t = \alpha_0 + \alpha_t Z_{t-1} + \cdots + \alpha_k Z_{t-k} + \varepsilon_t \qquad (11)$$

Where Z_t is a $(n \times 1)$ vector of integrated variables of the same order, the vector of the constant term is represented by α_0 of order $(n \times 1)$, $\alpha_t, \dots, \alpha_k$ are parameters and ε_t is an error term. To determine the short-run relationship among money demand and its determinant, Error Correction Model (ECM) can be written in the following form:

$$\Delta lnRM_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta lnRM_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta GGEG_{t-i} + \sum_{i=1}^{n} \alpha_{3i} \Delta HFCE_{t-i} + \sum_{i=1}^{n} \alpha_{4i} \Delta lnCPI_{t-i} + \sum_{i=1}^{n} \alpha_{5i} \Delta FDI_{t-i} + \sum_{i=1}^{n} \alpha_{6i} \Delta lnEXP_{t-i} + \gamma ECT_{t-1} + \varepsilon_t$$

If the coefficient γ of the ECT_{t-1} is significant, then it is the indication that there exists a short-run relationship between the variables. The estimated value of γ also tells us about the divergence or convergence speed from the short-run to the long-run equilibrium. The positive sign of the value of the coefficient γ is the indication of divergence while the -ve sign of the coefficient is the indication of

convergence towards the long-run relationship. The stability of long-run coefficient is checked by the sign and significance of the coefficient of ECT_{t-1}. If the coefficient is negative and significant then the long-run relationship among variables is stable. (Kremers, Ericsson, & Dolado, 1992; Banerjee, Dolado, & Mestre, 1998).

Variables

All the variables incorporated in the model be described in detail with their units.

Real Money

Real money which is our dependent variable is obtained after dividing the broad money (BM) by consumer price index (CPI), also known as narrow money. Generally, it consists of credit at commercial banks and other money which is in the accessible account.

Consumer Price Index (CPI)

The Consumer price index is a quantity that observes the weighted average of services and prices of a basket of consumer goods. It includes food, transportation, medical care, and other expenses. Consumer price indexes is used to study the cost of living. CPI is a commonly used statistic to identify the period of inflation or deflation. The Laspeyres formula is generally used to calculate the CPI and 2010 is considered as the base year for the construction of CPI.

Household Final Consumption Expenditures (HFCE)

Household final consumption expenditure is also formerly called private consumption. It represents the market value of all ggodes and services purchased by households. It also consists of durable goods (such as cars, home computers and washing machines etc.). Purchases of houses are not included but the imputed rent is included in this(WDI, 2019). If the HFCE increase, the demand for money would increase. So, HFCE has a positive relationship with demand for money.

Foreign Direct Investment (FDI)

Foreign direct investment is the investment of a group or a company or an individual or an organization in one country's business interest in other countries. FDI consists of the total aggregate of long term capital, short term capital, reinvestment of earnings which are given in the form of balance of payments and equity capital. This chain indicates the net flow in the writing economy from foreign investors and is divided by the gross domestic product (WDI, 2019). The real money is obtained by dividing the broad money by the consumer price index. They do not include the payment of employees and investment income and transfer payments (WDI, 2019). The export of services and goods has a positive impact on demand for money.

IV. EMPIRICAL RESULTS

The empirical results for the model defined in equation (7)are calculated based on annual time series data which has been taken from the World Development Indicator (2019).

Descriptive Statistics

The descriptive statistics of all the variables are shown in Table 1. The descriptive measures consist of mean, median, maximum value, minimum value, coefficient of skewness, and coefficient of kurtosis.

Table 1: Descriptive Statistics for the Variables

Variables	Descriptive Measures						
	Mean	**Median**	**Max.**	**Min.**	**Std. Dev.**	**Skewness**	**Kurtosis**
LRM_t	24.2306	24.1774	25.2568	23.0259	0.7054	0.0374	1.7151
$GGFCE_t$	6.2779	6.4051	48.3239	−10.2131	10.6548	1.5702	7.8749
$HFCE_t$	76.8733	76.6120	83.0958	68.2164	4.0941	−0.1718	1.8892
$LCPI_t$	3.5478	3.6489	4.9788	2.2098	0.8436	0.1082	1.8637
FDI_t	0.9222	0.6309	3.6683	0.1027	0.8427	2.0089	6.4212
$LEXP_t$	27.1203	27.1441	27.8841	25.9294	0.6067	−0.4209	1.9941

Coefficient of Correlation

The correlation coefficient between the variables is presented in Table 2. From the table, it is clear that the dependent variable (real money) has a positive relationship with all independent variables while $GGFCE_t$ has a negative relationship with $LCPI_t$ and $LEXP_t$. Similarly, $HFCE_t$ has negative relationship with FDI_t and $LEXP_t$.

Table 2: Correlation Coefficient among the Variables

Variables	Correlation					
	LRM_t	$GGFCE_t$	$HFCE_t$	$LCPI_t$	FDI_t	$LEXP_t$
LRM_t	1.0000					
$GGFCE_t$	0.0287	1.0000				
$HFCE_t$	0.1275	0.1760	1.0000			

$LCPI_t$	0.9788	−0.0438	0.1365	1.0000		
FDI_t	0.5338	0.0987	−0.0161	0.4030	1.0000	
$LEXP_t$	0.9701	−0.0345	−0.0781	0.9471	0.5375	1.0000

Unit Root Test

The majority of the macroeconomic variables have a unit root problem. So, first of all, unit root of the variables have been checked by using ADF test. The ADF test is calculated at a level and first difference. The intercept term is included in both conditions at the level and first difference. Meanwhile, the ADF test is also calculated by excluding intercept and trend at the level and first difference. The calculated value of ADF is presented in Table 3 with corresponding p-values in the brackets. From the results of the ADF test, it is clear that none of the variables is stationary at level either trend is included or not. The same result happens if we do not include both trends and intercept at the level. All the variables are stationary at first difference either trend is included or not or intercept and trend also excluded. Therefore, overall we conclude that all the variables are stationary at the first difference and their order of integration is 1.

Table 3: Unit Root Test for Stationarity at Level and First Difference (ADF Test)

Variables	At Level			At First Difference			Conclusion
	No Trend	Trend	None	No Trend	Trend	None	
LRM_t	−1.0208 (0.7350)	−2.5637 (0.2980)	5.3542 (1.0000)	−4.6136** (0.0008)	−4.6217** (0.0040)	−3.0668** (0.0032)	I(1)
$GGFCE_t$	−2.0629 (0.2602)	−1.9453 (0.6078)	−1.3053 (0.1732)	−6.7654** (0.0000)	−6.7005** (0.0000)	−6.8841** (0.0000)	I(1)
$HFCE_t$	−1.4899 (0.5266)	−2.0238 (0.5685)	−0.3318 (0.5583)	−7.1790** (0.0000)	−7.4843** (0.0000)	−7.2781** (0.0000)	I(1)
$LCPI_t$	0.0715 (0.9587)	−2.8160 (0.2049)	1.8333 (0.9819)	−3.8398** (0.0066)	−4.1232* (0.0157)	−3.9326** (0.0023)	I(1)
FDI_t	−2.4751 (0.1305)	−2.4827 (0.3339)	−1.4178 (0.1427)	−3.8609** (0.0057)	−3.8725* (0.0290)	−3.9245** (0.0003)	I(1)

$LEXP_t$	−1.8661	−1.8225	2.8837	−6.2425**	−6.4362**	−5.2297**	I(1)
	(0.3438)	(0.6722)	(0.9985)	(0.0000)	(0.0000)	(0.0000)	

Lag Order Selection Criteria

Table 4 represents the lag order collection criteria of VAR. The lag order selection criteria are checked by using different criteria. Different criterion to choose lag order are sequential modified likelihood ratio test (LR), Akaike information criteria (AIC), final prediction error (FPE), Hannan-Quinn information criteria (HQ) and Schwarz information criteria (SIC). Table 4 shows that the LR and FPE criteria suggest 2 lag order while SIC and HQ suggest 1 lag order. As the lag order selection is made based on SIC so we choose the order of VAR as lag 1.

Table 4: Lag Order Selection Criteria of VAR

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	−226.0820	NA	0.0342	13.6519	13.9212	13.7437
1	−9.6525	343.7409*	8.71e-07	3.0384	4.9239*	3.6814*
2	31.2985	50.5866	8.03e-07*	2.7472*	6.2488	3.9413

Co-integration Analysis

The co-integration analysis is based on Trace value statistic (λ_{trace}) and maximum Eigenvalues (λ_{max}). For co-integration analysis, using trace value statistic we set the null hypothesis that there is no co-integrated vector versus the alternative hypothesis that, there is at least one co-integrating vector.

Table 5: Trace Valueand Max. Eigen Statistics (Co-integration Test)

H0	H1	Trace Statistics	Critical Value at 5%	Max. Eigen Statistic	Critical Value at 5%
r = 0*	r ≥ 1	159.5597 (0.0000)	95.7537	75.8898 (0.0000)	40.0776
r ≤ 1*	r ≥ 2	83.6699 (0.0026)	69.8189	41.6571 (0.0048)	33.8769
r ≤ 2	r ≥ 3	42.0128	47.8561	19.8768	27.5843

		(0.1584)		(0.3498)	
r ≤ 3	r ≥ 4	22.1360 (0.2910)	29.7971	13.8640 (0.3763)	21.1316
r ≤ 4	r ≥ 5	8.2719 (0.4368)	15.4947	6.7221 (0.5225)	14.2646
r ≤ 5	r ≥ 6	1.5498 (0.2132)	3.8415	1.5498 (0.2132)	3.8415

Trace test and Max. Eigen test indicates 2 co-integrating vectors

The other null hypotheses are that there is at most one co-integrating vector, there is at most two co-integrating vectors and so on. Table 5 shows the empirical results for the trace and maximum Eigen statistic. The calculated value of the trace statistic is 159.5597. The corresponding critical value at a 5 % level of significance is 95.7537, which is a clear indication for the rejection of the null hypothesis. We conclusion that there is at least one co-integrating vector. Similarly, for two cointegrating vector,s the value of trace statistics is 83.6699. The corresponding critical value at 5 % level of significance is 69.8189, which also indicates that the null hypothesis is rejected. It is completed that there is at least 2 co-integrating vectors. The estimated value of trace statistic is 42.0128, which is less than the critical value 47.8561 at a 5 % level of significance. We do not reject the null hypothesis, which indicates that there exist two co-integrating vectors. Similarly, we explain the maximum Eigen statistic. Based on the empirical results it is a clear indication that there exist two co-integrating vectors.

Long and Short Relationship

After discussing the co-integration analysis, we determine the long and short-run relationship of real demand for money and its determinant. The empirical results for the long and short-run relationships are presented in Table 6. The estimated value of the coefficients and their corresponding t-test and p-values are given in column 2, 3 and 4 respectively. The estimated coefficient for government expenditures is 0.0277, the value of t-statistic is 2.5341 and the corresponding p-value is 0.0167. It indicates that government expenditure has a positive and important effect on demand for money (real). Moreover, it can be interpreted as a 1 % point change in government expenditures, there will be a 2.7 % increase in real money. The second value of the second column is 0.0395, which is the estimated coefficient of the consumer price index. The consumer price index has a positive and significant effect on real demand for money. Similarly, a 1 % point change in foreign direct investment there will be a 6.49 % increase in real demand for money. Foreign direct investment has a positive and significant effect on real demand for money. The estimated value of the export is 0.0570 and their corresponding p-value is 0.000 which indicates that the export is significant and has a positive impact on the real demand for money. The estimated value of the intercept is 6.0435 which is also significant. The value of the coefficient of determination is 0.9924, which indicates that a 99.24 % variation in real demand for money is explained by government expenditures, inflation, household final consumption expenditure, foreign direct investment, and export. It also indicates that the model is good fitted, further the value of adjusted R^2 also shows that the model is appropriate. The individual t-test indicates that all variables have a positive and significant impact but the overall test of significance indicates the significance of the variables. The results of the long-run indicate that there exist a long-run relationships among real demand for money and its determinant.

When it is proven that the co-integration exists then the ECM is used to find the dynamic relationship. The speed of adjustment of short-run equilibrium to the long-run is determined by the value of the coefficient

of the error term. Table 6. shows the empirical results of the short-run analysis. The calculated value of $\Delta GGFCE_t$ is 0.0210 which is significant. It means that a 1 % point increase in $\Delta GGFCE_t$ there will be a 2.10 % increase in real demand for money. The calculated value of $\Delta LCPI_t$ is -0.0129 which indicate that there is a negative relationship of $\Delta LCPI_t$with $\Delta LRM_t$and it is not significant. Similarly, the $\Delta HFCE_t$ has a positive relationship with ΔLRM_t and it is not significant. ΔFDI_t has a positive and significant relationship with ΔLRM_t. Further, 1 % point increase in ΔFDI_t there will be a 4.09 % increase in ΔLRM_t. The calculated value of $\Delta LEXP_t$ is 0.0288 which indicate a positive and significant relationship with ΔLRM_t. Moreover, a 1 % increase in export there will be 0.0288 % increase in ΔLRM_t.

Table 6: Long and Short Run Relationship

Variables	Long-Run Results			Variables	Short -Run Results		
	Coefficient	t-Statistic	P-Values		Coefficient	t-Statistic	P-Values
$GGFCE_t$	0.0277	2.5341	**0.0167**	$\Delta GGFCE_t$	0.0210	2.8971	**0.0086**
$HFCE_t$	0.0164	3.9694	**0.0004**	$\Delta HFCE_t$	0.0263	0.6133	0.5463
$LCPI_t$	0.0395	5.9282	**0.0000**	$\Delta LCPI_t$	-0.0129	-0.3306	0.7442
FDI_t	0.0649	3.4282	**0.0018**	ΔFDI_t	0.0409	2.2014	**0.0390**
$LEXP_t$	0.0570	5.7353	**0.0000**	$\Delta LEXP$	0.0288	3.5274	**0.0020**
Constant	6.0435	2.2461	**0.0322**	ΔLRM_{t-1}	0.0295	0.2068	0.8382
				$\Delta GGFCE_{t-1}$	0.0129	1.7531	0.0942
				$\Delta HFCE_{t-1}$	0.0807	0.1509	0.8815
				$\Delta LCPI_{t-1}$	-0.0673	-0.1502	0.8821
				ΔFDI_{t-1}	0.0885	0.5183	0.6097
				$\Delta LEXP_{t-1}$	0.0135	1.4216	0.1698
				ECT_{t-1}	-0.5521	-2.9577	**0.0075**
				Constant	0.0552	1.9475	0.0650

$R^2 = 0.9924$	$F - Stat. = 781.9176^{**}$	$R^2 = 0.7961$	$F - stat. = 6.8327^{**}$
$Adj. R^2 = 0.9911$	$D.W = 1.6202$	$Adj. R^2 = 0.6796$	$D.W = 2.0059$

To test the effect of concerning variables on real demand for money in Pakistan, a one-year lag of government expenditure, household consumption expenditure, consumer price index, foreign direct investment, and export are used. On average one percent change in $\Delta LCPI_{t-1}$there will decrease in ΔLRM_t by 0.0673 percent but insignificant. Similarly, a 1 % increase in $\Delta LEXP_{t-1}$ there will be an increase in ΔLRM_t by 0.0135 %. Similarly, the variable can be interpreted. Based on correct negative sign and significant value of ECM in short-run estimates. There is a clear indication of a long run relationship among variables. The calculated value of the Coefficient of ECT_{t-1} has a negative sign which is the sign of convergence to equilibrium. 55.21 % disequilibria is corrected in one year because the coefficient value of ECT_{t-1} is -0.5521. So, the real demand for money is very important for the monetary policy of Pakistan.

According to our results, only three variables, foreign direct investment, government expenditure, and export have a positive and statistically important impact on real demand for money in Pakistan at 0.05 and 0.1 significance level respectively. All other variables are statistically insignificant at 5% significance level in short-run analysis,

Diagnostic Analysis

Once the model is estimated, then different analytical tests are applied to residuals to check either the model is suitable or not. The serial correlation test, normality test, and different test for homoscedasticity are applied. The model specification test is also applied to check either model is correctly specified or not. Table 7 shows the estimated values of a diagnostic test for long-run and short-run model. For homoscedasticity, different tests (Godfrey, Harvey, Glejser, ARCH, and White) are used. The results of all tests show that we do not reject the null hypothesis (there is no heteroskedasticity) and conclude that there exists homoscedasticity for the residual of both estimated model (long-run and short-run). Jarque-Bera test is applied to check the normality of the residual. The calculated value of the test statistic and corresponding p-value represents that the null hypothesis "(residuals are normally distributed with 0 mean and variance 1)" is not rejected, which is the clear indication that the residualss is normally distributed for the long and short-run. To check the serial correlation of the residuals, the Breush-Godfrey test is applied. The calculated value of the test statistic and related p-value does not provide sufficient evidence to reject the null hypothesis (there is no serial/autocorrelation), so we conclude that there is no serial correlation between the residual. Ramsey RESET test is apply to check the model specification. The calculated value and p-value indicate that the null hypothesis (there is no specification error/bias) is accepted and we conclude that both the models are correctly specified.

Table 7: Diagnostic Tests in Long Run

Diagnostic	Test	Long Run		Short Run	
		Test Statistic	P-Value	Test Statistic	P-Value
Heteroskedasticity Test	Godfrey Test	1.1835	0.3406	0.8338	0.6178
Heteroskedasticity Test	Harvey Test	0.6651	0.6528	1.3566	0.2609

Heteroskedasticity Test	Glejser Test	0.8627	0.5174	1.1615	0.3682
Heteroskedasticity Test	ARCH Test	0.2444	0.6243	0.3010	0.5872
Heteroskedasticity Test	White Test	1.3167	0.2838	0.7324	0.7064
Normality Test	Jarque-Bera	0.0309	0.9847	0.3837	0.8254
Serial Correlation	Breush-Godfrey Test	0.7771	0.4694	0.1772	0.9105
Model Specification Test	Ramsey RESET Test	0.1076	0.7452	2.1274	0.1602

Stability of the Parameters

For the construction of the monetary policy, there must be a stable and predictable long-run relationship among real money, government expenditures, consumer price index, household final consumption expenditure, foreign direct investment, and export. To determine that either there exists a stable relationship or not, the stability of the long-run, as well as short-run coefficient, is checked. Brown et al., (1975) recommended a cumulative sum (CUSUM) test check the parameters constancy and the cumulative sum of squares (CUSUMQ) test to examine the structural stability of the parameters. If the value of the CUSUM test falls within the 5 % level of significance. then the estimated coefficients are known as stable.

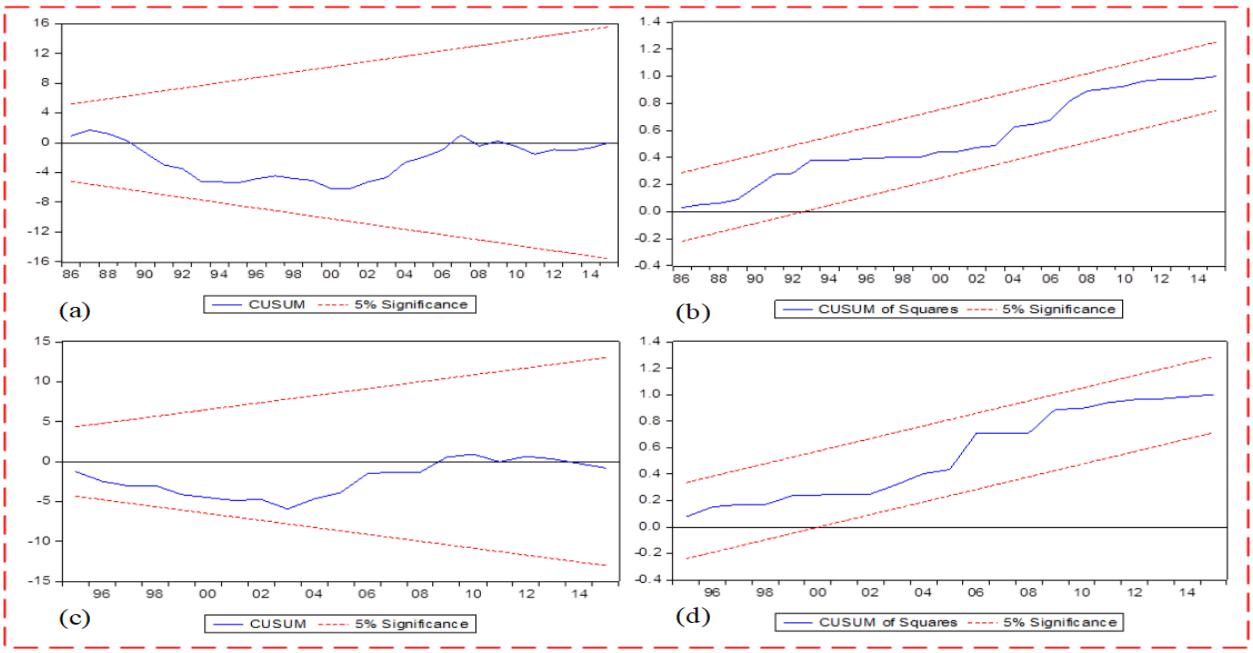

Figure 1: CUSUM and CUSUMQ plot for Long and Short Run

For long-run the cumulative sum of the recursive residuals model is plotted on Y-axis and time is taken on X-axis which is shown in Figure 1 (a) while for the short-run it is plotted in Figure 1 (c). The graph shows

that the value of CUSUM falls within the 5 % level of significance values, so we conclude that the estimated coefficients are stable. Similarly, the values of the CUSUMSQ test are plotted in Figure 1 (b) for the long –run, and in Figure 1 (d) for the short-run. The cumulative sum of the square of recursive residuals is plotted along Y-axis and along the X-axis time period is taken. The calculated values lie within a 5 % level of significance which shows that the parameters are stable. Hence, both the graph indicate that the model is stable over the whole sample and the real demand for money as defined above is stable. This is the evidence of a stable regression coefficient in the situation of random and unexpected shocks.

V. SUMMARY AND CONCLUSION

The purpose of this research is to discover the disaggregated factors of demand for money in Pakistan and examine their long and short run relationship with demand for money in Pakistan. The data hass been taken over the time period 1980-2018. The ADF test is used at level and first difference to check the stationarity of the data, the results show that all the variables are stationary at first difference. The Johansen cointegration technique is employed to check the the cointegrationed relationship among the variables of the models. The empirical results show that there exist two cointegrating vectors. The long run result of the model explains the elasticity of CPI, and export of goods and services with respect to demand for money. Moreover. independent variables have positive and significant impact on demand for money in Pakistan.

The results of short run analysis of the study explains the short tun relationship of demand for money with government expenditure, household expenditure, consumer price index, foreign direct investment and export. The results demand for money is determined by the previous period of government expenditures, foreign direct investment and exports in short run. Unlike the long run, CPI has negative and insignificant impact on demand for money in short run in case of Pakistan. Government expenditure, foreign direct investment and export has positive and significant impact on demand for money in short run while other variable has insignificant impact. ECT has significant coefficient and negative sign which is correct theoretically, and it also indicates that short run converges to long run equilibrium.

The findings of the study show that the relationship between expenditures components, CPI, FDI, Export and demand for money might be suitable for policy makers in the planning of a stable monetary policy. M2 is most practical target to maintain the pace of economic growth and to control the inflation. In the construction of stable and effective monetary policy, foreign direct investment, exports, and inflation should be given more importance as compared to government expenditures and household expenditures. Sometimes, there are non-developmental (debt servicing, on defense and subsidies) expenditures by the government in Pakistan. Instead, foreign direct investment, exports and consumer price index depict the real image of economic activity in the Pakistan.

REFERENCES

1. Abdullah, M., Chani, M. I., & Ali, A. (2013). Determinants of Money Demand in Pakistan: Disaggregated Expenditure Approach. *World Applied Sciences Journal, 24*(6), 765-771.

2. Abe, S., Fry, M. J., Min, B. K., Vongvipanond, P., & Yu, T. P. (1975). The demand for money in Pakistan: Some alternative estimates. *The Pakistan Development Review*, *14*(2), 249-257.

3. Ahmad, M., & Khan, A. H. (1990). A Reexamination of the Stability of the Demand for Money in Pakistan. *Journal of Macroeconomics*, *12*(2), 307-321.

4. Akhtar, M. A. (1974). The demand for money in Pakistan. *The Pakistan Development Review*, *13*(1), 40-54.

5. Anwar, S., & Asghar, N. (2012). Is demand for money stable in Pakistan?. *Pakistan Economic and Social Review*, 1-22.

6. Bahmani-Oskooee, M., & Baek, J. (2017). Economic uncertainty, monetary uncertainty and the Korean demand for money. *Journal of Economic Policy Reform*, *20*(1), 86-97.

7. Bahmani-Oskooee, M., & Barry, M. P. (2000). Stability of the demand for money in an unstable country: Russia. *Journal of Post Keynesian Economics*, *22*(4), 619-629.

8. Bahmani-Oskooee, M., & Bohl, M. T. (2000). German monetary unification and the stability of the German M3 money demand function. *Economics letters*, *66*(2), 203-208.

9. Bahmani-Oskooee, M., & Maki-Nayeri, M. (2019). Asymmetric Effects of Policy Uncertainty on the Demand for Money in the United States. *Journal of Risk and Financial Management*, *12*(1), 1.
10. Bahmani-Oskooee, M., & Nayeri, M. M. (2018). Policy Uncertainty and the demand for money in Australia: An asymmetry analysis. *Australian Economic Papers*, *57*(4), 456-469.

11. Bahmani-Oskooee, M., & Shabsigh, G. (1996). The demand for money in Japan: evidence from cointegration analysis. *Japan and the World Economy*, *8*(1), 1-10.

12. Bahmani-Oskooee, M., Xi, D., & Bahmani, S. (2019). More evidence on the asymmetric effects of exchange rate changes on the demand for money: evidence from Asian. *Applied Economics Letters*, *26*(6), 485-495.
13. Banerjee, A., Dolado, J., and Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of time series analysis*, *19*(3), 267-283.

14. Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society. Series B (Methodological)*, 149-192.

15. 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.

16. Dickey, D. A., and Fuller, W. A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica: Journal of the Econometric Society, 49*(4), 1057-1072.

17. Engle, R. F., and Granger, C. W. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica: journal of the Econometric Society, 55*(2), 251-276.

18. Friedman, M. (1956). The Quantity Theory of money: A Restatement. *University Chicago Press*, 128-138.

19. Haghighat, J. (2011). Real Money Demand, Income and Interest Rates in Iran: Is there a Long-run Stable Relation? *World Journal of Social Sciences, 1*(2), 95-107.

20. Hossain, A., and Ali, S. S. (1994). The Search for a Stable Money Demand Function for Pakistan: An Application of the Method of Cointegration [with Comments]. *he Pakistan Development Review, 33*(4), 969-983.

21. Johansen, S., and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Ëointegration with Applications to the Demand for Money. *Oxford Bulletin of Economics and statistics, 52*(2), 169-210.

22. Judd, J. P., and Scadding, J. L. (1982). The Search for a Stable Money Demand Function: A Survey of the Post-1973 Literature. *Journal of Economic Literature, 20*(3), 993-1023.

23. Khan, A. H. (1980). The Demand for Money in Pakistan: Some Further Results. *The Pakistan Development Review, 19*(1), 25-50.

24. Khan, A. H., and Ali, S. S. (1997). The Demand for Money in Pakistan: An Application of Cointegration and Error-Correction Modeling. *Savings and Development*, 49-62.

25. Kremers, J. J., Ericsson, N. R., & Dolado, J. J. (1992). The power of cointegration tests. *Oxford bulletin of economics and statistics*, *54*(3), 325-348.

26. Mangla, I. U. (1979). An Annual Money Demand Function for Pakistan: Some Further Results. *The Pakistan Development Review, 18*(1), 21-33.

27. Mitchell, D. J. (2005). The Impact of Government Spending on Economic Growth. *The Heritage Foundation*, 1-18.

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

29. Nisar, S., and Aslam, N. (1983). The Demand for Money and the Term Structure of Interest Rates in Pakistan. *The Pakistan Development Review*, 97-116.

30. Price, S., and Nasim, A. (1999). Modelling Inflation and the Demand for Money in Pakistan; Cointegration and the Causal Structure. *Economic Modelling, 16*, 87-103.

31. Qayyum, A. (1998). Error Correction Model of the Demand for Money in Pakistan. *Kashmir Economic Reviews* , 1-2.

32. Qayyum, A. (2005). Modelling the Demand for Money. *The Pakistan Development Review, 44*(3), 233–252.

33. Qayyum, A., and Nishat, M. (2001). Sectoral Analysis of the Demand for Real Money Balances in Pakistan [with Comments]. *The Pakistan Development Review* , 953-966.

34. Thornton, J. (1996). Cointegration, Causality and Export-Led Growth in Mexico, 1895–1992. *Economics Letters, 50*(3), 413-416.