FACTORS AFFECTING DEMAND FOR REAL MONEY AND INTERNATIONAL CAPITAL MOVEMENT IN PAKISTAN: AN ANALYSIS

Abstract

The concept of monetary policy is based on the money demand function; therefore, to shed light on Pakistan’s monetary policy, this study investigates the factors that influence demand for real money in the country. The data for this research have been taken from world indicators for the period of 1960-2016. The present research examines the influence of real returns and down grading of domestic money in Pakistan. Nevertheless, the demand for real money is highly influenced by the international interest rate. The rejection or acceptance of the log form is based on the non-linearity test. This test shows acceptance of the simple log form at the 1% level. Moreover, the normality and stability of the model in Pakistan are verified by the ARCH, LM, cumulative sum (CUSUM and CUSUMSQ) tests. Furthermore, the ARDL approach is used to find associations between the dependent variables and regressors. The findings show that there is a long-run relationship between money demand and the regressors.

JEL CLASSIFICATION: B4; C41; E10.

KEYWORDS: MONEY DEMAND; RESERVE; INFLATION; EXCHANGE RATE, INTERNATIONAL DEPOSIT INTEREST RATE OF CANADA; PAKISTAN.
1. Introduction

Past theoretical literature shows considerable disagreement over the function of money in the economy of any country, but two views have now emerged on this topic. The most important pillar of monetary economics is the actual demand for money. This paper empirically investigates the effects of the nominal exchange rate, the deposit interest rate, consumer prices as a proxy for inflation and the international interest rate of Canada on the demand for money in Pakistan. The aim of this work is to scrutinize the effect of macroeconomic factors on real money demand in light of the pragmatic evidence from Pakistan and to re-evaluate the existing empirical research on money demand in the country.

The money demand function and permanent income are taken as scale variables. Moreover, the interest rate, foreign interest rate, exchange rate, inflation rate and total reserves are relevant determinants of the real demand for money. The paper also checks for effects of the nominal exchange rate, the domestic deposit interest rate, stock prices, a proxy for inflation and the international interest rate of Canada on the demand for money in Pakistan. The country’s economy has faced chronic issues in the recent past. Political instability, oil price shocks, unemployment, high inflation, financial crises, and terrorism have been the main issues affecting the economy of Pakistan. The economy grew an average of 7% each year from 2002 to 2006. However, in 2007, it declined very sharply at the rate of 1.6% and it again recovered to increase by 3.8% in 2010.

The organization of this paper is as follows:

The first part of this study briefly explains the concept of the real money demand function and reviews studies that have been done on this topic, while the second section explains the stages and specifications of the model. The third section provides the data analysis and discussion of the results for Pakistan. Policy recommendations based on the analysis and concluding remarks are briefly highlighted at the end of the study.

2. Literature review

The Box-Cox technique (1964) is used to assess the fitness of the double-log shape for analysis. Furthermore, the movement of the LM is calculated based on the magnitude of inflation, open market operations, seigniorage, the international interest rate and the domestic interest rate, which demonstrates
the status of LM curve in the Mundel-Fleming model. Moreover, the effect of easy fiscal policy has also been assessed using the method of Romer (2006). Lee (2008), in analysing the theoretical and empirical issues surrounding money demand stabilization and structural adjustment policies in China, stated that stabilization occurs through a mechanism whereby the supply of money adjusts to its demand. This author found that demand for money is more sensitive to the nominal interest rate on financial assets in other developing countries than Arab countries. He further noted that the money demand function is inversely related to the exchange rate and international interest rate and, moreover, is steady over time in Arab nations.

Real money demand in India was studied by Krishna (1996) for the period of 1990 to 1996. He used GDP, expected price level, interest rate, and structural variables such as bank branches, population and agricultural output for the empirical analysis in his study. In India's money demand function, income was found to be the most important variable. The author also concluded that price levels, the interest rate and agricultural output have a negative association with money in the money demand function.

The long-term demand function for narrow and broad money in Mexico was studied by Guillermo et al. (1996) for the period of 1980:1-1994:1. An error correction model was used for the analysis, and the author concluded that there is a single long-run co-integrating association among real gross domestic product, the 91-day T-bill rate and real money balances. Nevertheless, the short-run findings revealed a positive association between broad money and income in the formulation of monetary policy.

Alkaswani and Altawajir (1999) described the determinants of money demand in Saudi Arabia (1977:1-1997:3). They used co-integration and error correction techniques for analysis and found that the exchange rate and real income have a positive association with the money demand function. In contrast, there is a negative association between the money demand function and the interest rate. They concluded that there is a stationary and significant long-run relationship of the demand for narrow money with other macroeconomic variables in Saudi Arabia. They also found that there is a minor effect of the interest rate on real money demand due to religious factors. For the analysis of narrow and broad money demand in Mozambique, the error correction technique was applied by Johansen in 1988 using monthly data from January 1991 to September 1997. She found that agricultural and industrial output and the return on financial instruments are the main determinants of broad money in Mozambique. Moreover, she
found a structural break in money balances from 1996 to 1997 because in this period, economic activities grew very rapidly. She concluded that the coefficients on industrial outputs and agriculture are highly significant in Mozambique, meaning that these variables play a vital role in the determination of money demand.

The narrow money demand function for Ethiopia was studied by Sterken (2004), who observed that in 1974 and 1991, Ethiopia faced large political changes, as well as serious shocks to population growth and drought in 1975 and 1985. Food shortages seriously affected narrow money demand and inflation. Narrow money demand was stable throughout the period under study. The author concluded that real income has a positive effect and inflation has a negative impact. The link between money demand and interest rates was studied by James Tobin using U.S. data. Tobin (1947) suggested that ‘idle balance’ is another term for transaction balances. He studied the relationship between the average level of idle balances and average interest rates in the period 1922–1941 and found an inverse relationship between the two. The money demand function is very strongly influenced by the interest rate. Other empirical studies resoundingly verified the findings of Tobin. However, the sensitivity of this relationship weakens in the case of a liquidity trap. Keynes stated that a liquidity trap may occur if interest rates are extremely low, but empirical studies have stated that a liquidity trap has never yet been seen. David et al. (1963) showed that there is a large sensitivity of money demand to interest rates if the movement of interest rates is very low. Stephen (1973) found that the tendency of the interest rate to move cannot occur when interest rates are very low. In fact, it can be seen that the sensitivity of the interest rate did not change from epoch to epoch under such circumstances. In the same way, Brunner and Meltzer (1971) estimated a money demand function with data from the 1930s; they calculated the same results as those found for money demand in the 1950s. These authors found that there was little evidence in favour of the existence of a liquidity trap during the Great Depression period. The studies of Brunner and Meltzer indicated that there is a high association between stabilization of the demand for money and the existence of a liquidity trap. Brunner and Meltzer’s studies used data from the 1930s, and they argued that there was no liquidity trap during that decade. Their study concluded that the function of real money demand is steady for a long time. They also suggested that the money demand function has been stable over long periods.
of time, but the results of money demand were not the same in different periods.

The elasticity of money demand was also measured by using the Baumol (1952) model. This author found that the relationship between income and money demand transactions is neither linear nor relative. Nevertheless, he stated that a change in income slightly influences the demand for money. Tobin (1956) offered the hypothesis of liquidity preference, which depicts two problems of the Keynesian theory of money demand. He argued that the inelasticity of future interest rates is a root of Keynes’s liquidity preference.

Tobin (1956) also suggested that rational agents desire to hold a definite quantity of real money balances for precautionary, transaction and speculation purposes, with wealth, return on money, equity and the inflation rate being functions of real money balances.

Greenaway et al. (2010) empirically investigated the cases of Pakistan, Mexico and Uruguay, where currency substitution took place due to the high inflation rate. Qayyum (2005) offered empirical evidence for the period of 1960-1969 in Pakistan and concluded that demand for real money balances is negatively associated with inflation and positively associated with income. Similarly, Khan (2005) and (2009) found long-run and short-run associations between real money demand and all other explanatory variables for the period of 1982 to 2002. He assessed time series data for Pakistan by using the autoregressive distributive lag approach and found that there is a positive relationship between the interest rate and the inflation rate. Javed (2005) stated that the interest rate is strongly influenced by the money supply.

Hooper (1978) and Hsu (2011) used the Cagan model and investigated the pressure of the inflation rate and currency substitution on real money demand in Pakistan and other nations. They found that inflation has a positive association with the demand for money. Lyoboyi and Pedo (2013) used data for the period 1970-2010 to estimate the money demand function for Nigeria. The ARDL bounds testing approach was used to analyse the data for that period. Real income, the short-term interest rate, and the expected exchange rate were found to be the main determinants of the demand for money in Nigeria. These authors found that the money demand function was significantly affected by real income and the interest rate and concluded that the coefficient of income was positive and of the interest rate
was negative. The coefficients on both variables were significant in the short term and long term. The international interest rate and exchange rate coefficients were insignificant, indicating that these variables did not influence the money demand function.

3. Data and Analysis

GOLD (1976) and Huchet-Bourdon (2013) describe the demand for real money as follows:

\[
\log(m^d) = \log(y, tr, er, cint, inf)
\]

\[
\log(m^d) = c + a \log(y) + b \log(er) + d \log(inf) + f\log(cint) + \log(tr) + e \tag{1}
\]

\[
\log(y) > 0, \log(er) < 0, \log(inf) > 0 \text{ or } < 0, \log(cint) > 0 \text{ or } < 0, \log(tr) < 0 \tag{2}
\]

Where;
- \(m^d\) = the demand for money,
- \(y\) = real income (GDP),
- \(tr\) = total domestic reserve,
- \(inf\) = \(cp\) = consumer prices as a proxy for inflation (annual %),
- \(er\) = the exchange rate, the official exchange rate of Pakistani currency per US$ (period average), and
- \(cint\) = the international deposit interest rate of Canada.

The explanations of the specific variables are given below:

**Real income:**
Real income is the annual growth rate of GDP. Real income may be defined as the market worth of all goods and services generated in a specific period in a country. For the purposes of this study, GDP is measured at a constant 1990 factor price in million PKR and has been taken as the annual growth rate of GDP in percent.

**Consumer price:**
The rate of change of the consumer price index is used as a proxy for the rate of inflation.

**Interest rate:**
The payment made by the borrower to the lender is called the interest rate. In the present study, it is the interest rate charged by commercial banks to
their customers; specifically, the deposit interest rate of Canada is taken as the foreign interest rate/international interest rate.

The nominal exchange rate (er) and the international interest rate (cint) have ambiguous predicted signs: they may be positive or negative. Therefore, they may influence real income in different directions. The depreciation of the real exchange rate has the following effect on real output:

$$\frac{\partial y}{\partial er} = -\text{Ser} \ln \text{cint} + \text{Sr} \ln \text{cint} / |J| > 0 \text{ or } \ln \text{er} < 0 \text{ and } > 0 \text{ if } \ln \text{er} < 0$$ (3)

In Eq. (2), Ser and Scint are partial derivatives, where $|J|$ shows a positive Jacobian value. If the value of $\ln \text{er}$ is negative, then depreciation of currency would raise real output. The increase in demand for money decreases the international interest rate and boosts the domestic interest rate, which shifts the LM curve upward and raises real output:

$$\frac{\partial Y}{\partial \text{cint}} = \text{Scint}, \text{lcint}/ |J| > 0 \text{ if } \text{lcint} < 0 \text{ and } < 0 \text{ if } \text{lcint} > 0$$ (4)

The extended Box-Cox model is given as follows:

$$V(\Omega) = V(\Omega) - 1/\Omega$$

where $\Omega$ is a parameter of any variable. The Box-Cox parametric transformation technique is used to reduce irregularities from problems of non-additivity, non-normality and heteroskedasticity. The application of the optimization condition shows that Eq. (1) will be converted into double-log form if $\Omega$ approaches zero, while it will be converted into linear form if the $\Omega = 1$ - $X^2$ distribution has one degree of freedom in the static test, which is given by $J(\Omega)$. $L(\Omega)$ is the value of the maximized loglikelihood function. Moreover, the LM, ARCH, CUSUM and CUSUMSQ tests are also used to check the fitness of the model.

4. Estimation Methodology

The data have been taken from world indicators. m$^d$ is in million PKR. Real m$^d$ is derived from the CPI. The international interest rate is the deposit rate of Canada. The base year of the stock prices (sp) is 2010. The nominal exchange rate in Pakistan is rupees per US dollar. The inflation rate
is proxied by the consumer price index. Data from 1960 to 2016 are used for the empirical analysis.
4.1 ARDL Bounds Test

The long-term and short-term dynamics are determined by employing the ARDL bounds test and ECM, respectively. The ARDL approach is easily used to conduct analyses with I(0) or I(1) data, providing unbiased estimation of long-term associations among the variables. Following Shahbaz et al. (2013) and Rahman (2017), the ARDL model employed in this paper is:

\[
\Delta \ln m_t = \beta + \sum_{i=1}^{m} \beta_1 \Delta \ln m_{t-1} + \sum_{i=1}^{m} \beta_2 \Delta \ln y_{t-1} + \sum_{i=1}^{m} \beta_3 \Delta \ln t_{t-1} + \sum_{i=1}^{m} \beta_4 \Delta \ln y_{t-1} + \sum_{i=1}^{m} \beta_5 \Delta \ln c_{t-1} + \eta_0 m_t + \eta_1 y_{t-1} + \eta_2 t_{t-1} + \eta_3 y_{t-1} + \eta_4 c_{t-1} + \epsilon_0 t_{t-1} + \epsilon_{t-1} + \epsilon_{0} \tag{5}
\]

where the variables assessed in this research are m, y, tr, er, inf and cint. \(\epsilon_0\) is a disturbance term and is serially homoskedastic, normally distributed and independent.

Eq. (2) depicts a particular type of error correction model (ECM) where the coefficients are not restricted; this is known as the "conditional ECM" of Pesaran et al. (2001). In Eq. (2), the six terms with addition signs depict the error correction dynamics, and the long-term association is presented in the second part (Shahbaz and Shrestha, 2005). The optimal lags are determined by using multiple information criteria (SC, AIC, HQ, etc.).

The short-run parameters are assessed by using the regular error correction mechanism (ECM), which is presented as follows:

\[
\Delta \ln m_t = \beta + \sum_{i=1}^{m} \beta_1 \Delta \ln m_{t-1} + \sum_{i=1}^{m} \beta_2 \Delta \ln y_{t-1} + \sum_{i=1}^{m} \beta_3 \Delta \ln t_{t-1} + \sum_{i=1}^{m} \beta_4 \Delta \ln y_{t-1} + \sum_{i=1}^{m} \beta_5 \Delta \ln c_{t-1} + \sum_{i=1}^{m} \beta_6 \Delta \ln c_{t-1} + \sum_{i=1}^{m} \beta_7 \Delta \ln c_{t-1} + \eta_0 m_t + \eta_1 y_{t-1} + \eta_2 t_{t-1} + \eta_3 y_{t-1} + \eta_4 c_{t-1} + \epsilon_0 t_{t-1} + \epsilon_{t-1} + \epsilon_{0} \tag{6}
\]

The speed of adjustment towards the long-run equilibrium is detected by using the error correction model. The long-run adjustment is presented by the negative and significant value of the error correction term (ECT) (Rahman and Mamun, 2016; Shahbaz et al., 2013).

The null and alternative hypotheses are as follows:

H0. There is no cointegration.

H1. There is cointegration.

The null hypothesis is checked by the F-test.
H0: \( \gamma = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0 \)  

(7)

H1: \( \gamma \neq \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0 \)  

(8)

Granger (1969) test suggested that it is not completely sufficient to comprehend about the association between two or more time series. So some associations may be spurious. Therefore, it is required to cross-check the causality of the results if the series are co-integrated.

The following VAR model is used to detect the absence of Granger causality:

\[
Z_t = \epsilon + b_1 Z_{t-1} + \ldots + b_p Z_{t-p} + m x_{t-1} + \ldots + m_p x_{t-p} + \varepsilon_t
\]  

(9)

\[
q_t = \pi + c_1 q_{t-1} + \ldots + c_p q_{t-p} + d z_{t-1} + \ldots + d_p z_{t-p} + \phi_t
\]  

(10)

Thus, \( H_0: b_1 = b_2 = \ldots = b_p = 0 \) is tested against \( H_A: X \) Granger-causes \( Y \). Similarly, \( H_0: c_1 = c_2 = \ldots = c_p = 0 \) is tested against \( H_A: Z \) Granger-causes \( Q \). In each case, if the null hypothesis is rejected, then it implies that there is Granger causality. The \( Z \) and \( Q \) series are in level form. \( \varepsilon_t \) and \( \phi_t \) are white noise error terms. There is cointegration between \( Z_t \) and \( Q_t \) if the coefficients of \( b_i \) or \( c_i \) are significantly different from zero. Thus, \( Z_t \) escort \( Q_t \) in the long run (Giles, 2011).

The short-run dynamics between \( Z_t \) and \( Q_t \) are represented by the coefficients of \( b_i \) or \( c_i \). If the coefficient of \( b_i \) is not zero, \( Z_t \) will move towards \( Q_t \) in the short run. Similarly, if the coefficient of \( c_i \) is not zero, \( Q_t \) will move towards \( Z_t \) in the short run.

4.2 Assessment, findings, analysis and discussion

4.2.1 Unit root estimation

The results of the augmented Dickey-Fuller test are depicted in Table 1. It is concluded that all variables are stationary at levels under the ADF test and hence of order I(0), except \( c_p \), which is stationary at the 1st difference.
Table 1. Results of the unit roots test

<table>
<thead>
<tr>
<th>Vars</th>
<th>Level (Intercept)</th>
<th>Level (Intercept and trend)</th>
<th>1st diff (Intercept and trend)</th>
<th>1st diff (Intercept and trend)</th>
</tr>
</thead>
<tbody>
<tr>
<td>m</td>
<td>-1.44</td>
<td>-1.76</td>
<td>-6.69*</td>
<td>-5.79*</td>
</tr>
<tr>
<td>er</td>
<td>0.096</td>
<td>-1.80</td>
<td>-6.030*</td>
<td>-5.23*</td>
</tr>
<tr>
<td>y</td>
<td>-5.66</td>
<td>0.624</td>
<td>-8.41*</td>
<td>-3.23</td>
</tr>
<tr>
<td>cp</td>
<td>0.864</td>
<td>-3.23</td>
<td>-4.61*</td>
<td>-6.62*</td>
</tr>
<tr>
<td>tr</td>
<td>0.602</td>
<td>-2.32</td>
<td>-6.29*</td>
<td>-6.46*</td>
</tr>
<tr>
<td>cint</td>
<td>-3.377</td>
<td>-1.83</td>
<td>-7.31*</td>
<td>-6.78*</td>
</tr>
</tbody>
</table>

(*, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.)

The stationary level of the dependent and explanatory variables is detected by the ADF test. The results show that real M1 money demand, real income, the nominal exchange rate, and the international interest rate have unit roots in levels. However, the domestic interest rate (di), stock prices (sp), and inflation (inf) are stationary in levels. Nonetheless, all variables are stationary at first difference.

4.2.2 Diagnostic Tests of the Model

All the diagnostic tests indicate that the present model is fit for analysis. The $R^2$ value is 0.632 (Adj-$R^2$:0.591), which implies that almost 63% of the change in the dependent variable is explained by the model. The model is not spurious because the value of the DW statistic is 2.01. Furthermore, the computed F-statistic = 17.24 (Prob. 0.000) rejects the null hypothesis that the regressors have zero coefficients. The ARDL bounds testing methodology is employed to check the long-run relationship in the model. The Breusch-Godfrey serial correlation LM test is used for testing serial independence, while the CUSUM and CUSUM of squares tests are used to check the normality of the model. Heteroskedasticity is checked by using the Breusch-Pagan-Godfrey test. The results are presented in Table 2 and show that there is no serial correlation and the model is fit for analysis.
Factors affecting demand for real money and international capital movement in Pakistan: an analysis

Table 2. Results of diagnostics tests

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Test</th>
<th>Prob Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Breusch-Godfrey serial correlation LM test</td>
<td>0.92</td>
</tr>
<tr>
<td>02</td>
<td>Breusch-Pagan-Godfrey heteroskedasticity test</td>
<td>0.26</td>
</tr>
<tr>
<td>03</td>
<td>ARCH test</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Table 3. VAR lag order selection criteria

<table>
<thead>
<tr>
<th>Lag</th>
<th>Lag L</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-112.05</td>
<td>NA</td>
<td>3.78</td>
<td>4.54</td>
<td>4.76</td>
<td>4.62</td>
</tr>
<tr>
<td>1</td>
<td>175.01</td>
<td>496.86</td>
<td>2.44</td>
<td>-5.11</td>
<td>-3.54*</td>
<td>-4.51</td>
</tr>
<tr>
<td>2</td>
<td>239.24</td>
<td>96.33</td>
<td>8.71*</td>
<td>-6.20*</td>
<td>-3.27</td>
<td>-5.07*</td>
</tr>
<tr>
<td>3</td>
<td>274.1</td>
<td>44.24</td>
<td>1.05</td>
<td>-6.15</td>
<td>-1.88</td>
<td>-4.51</td>
</tr>
<tr>
<td>4</td>
<td>301.3</td>
<td>28.45</td>
<td>1.99</td>
<td>-5.82</td>
<td>-0.19</td>
<td>-3.66</td>
</tr>
</tbody>
</table>

The findings of the VAR lag order selection criteria are presented in Table 3. These results indicate that the optimal lag length is two (2) out of a maximum of 4 lag lengths.

4.2.3 Stability test of the model

The cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals of squares (CUSUMSQ) tests suggested by Pesaran (1997) are employed to check the stability of the model for analysis. The CUSUM and CUSUMSQ statistics are displayed in Figures 1 and 2. The graphs of the CUSUM and CUSUMSQ remain within the boundaries at the 5% critical values; therefore, these statistics confirm the model stability. Thus, the model is fit for analysis.
4.2.4 Ordinary least squares approach for the log of real money demand

OLS regression estimates are presented in Table 3. In this empirical estimation, the analysis of the first difference is not employed because Onafowora (2008) suggests that valuable information is vanished out and the results are not clear. The findings show that the five explanatory variables
account for 63% of the change in the real money balance. The significance of all explanatory variables is determined at the 5% level.

### Table 4. Regression results for real money demand in Pakistan

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. error</th>
<th>t-statistics</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>3.66</td>
<td>0.37</td>
<td>0.66</td>
<td>0.46</td>
</tr>
<tr>
<td>Log(y)</td>
<td>-0.02</td>
<td>0.018</td>
<td>-1.31</td>
<td>0.19</td>
</tr>
<tr>
<td>Log(er)</td>
<td>-0.24</td>
<td>0.08</td>
<td>-3.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Log(inf)</td>
<td>0.18</td>
<td>0.06</td>
<td>2.97</td>
<td>0.00</td>
</tr>
<tr>
<td>Log(cint)</td>
<td>-0.14</td>
<td>0.03</td>
<td>-4.53</td>
<td>0.00</td>
</tr>
<tr>
<td>Log(tr)</td>
<td>0.03</td>
<td>0.02</td>
<td>1.60</td>
<td>0.10</td>
</tr>
<tr>
<td>R²</td>
<td>0.63</td>
<td></td>
<td>F-Stat</td>
<td>17.24</td>
</tr>
<tr>
<td>Adj R²</td>
<td>0.59</td>
<td>Prob (F-stat)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td>0.89</td>
<td>Sum of squ resi</td>
<td>0.34</td>
<td></td>
</tr>
</tbody>
</table>

Real money demand balances have a negative impact on real GDP, but this is insignificant at even the 10% level. Real money demand is negatively influenced by the nominal exchange rate, and it is highly significantly and positively influenced by the international interest rate. These findings are contradictory to those of Smith (2004), who reported that the inflation rate affects demand for money insignificantly. As the exchange rate rises, the value of domestic currency is reduced with the increase in the demand for money. Smith (2004) suggested that the effect of wealth is greater than the effect of money substitution, and he stated that the behaviour of the international interest rate shows that the movement of capital has a greater effect than the borrowing cost of capital. Last, the demand for money is positively influenced by total reserves, the coefficient of which is significant at the 10% level.
Table 5. ARDL approach

<table>
<thead>
<tr>
<th>Estimated Model</th>
<th>F-Stat</th>
<th>Opt Lag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Md (y, er, cint, tr, di)</td>
<td>F=7.554</td>
<td>2</td>
</tr>
</tbody>
</table>

Critical values from Pesaran et al. (2001) are shown above. The number of regressors is 5. The results from the Pesaran et al. (2001) and ARDL tests are depicted in Table 4. Therefore, it may be concluded that there is a long-term association between the dependent variable and regressors. This is because the computed F-statistic (7.554) is larger than the upper Pesaran et al. (2001) critical bound value at the 1%, 5% and 10% significance levels.

Table 6. Results of the error correction estimation

<table>
<thead>
<tr>
<th>Var</th>
<th>Coef.</th>
<th>Std. error</th>
<th>t-stat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.0402</td>
<td>0.017</td>
<td>2.261</td>
<td>0.028</td>
</tr>
<tr>
<td>D(m(-1))</td>
<td>0.0471</td>
<td>0.152</td>
<td>3.103</td>
<td>0.00</td>
</tr>
<tr>
<td>d(m(-2))</td>
<td>0.053</td>
<td>0.14512</td>
<td>0.366</td>
<td>0.716</td>
</tr>
<tr>
<td>d(cint(-1))</td>
<td>0.028</td>
<td>0.047</td>
<td>0.594</td>
<td>0.556</td>
</tr>
<tr>
<td>d(cint(-2))</td>
<td>0.047</td>
<td>0.039</td>
<td>1.215</td>
<td>0.232</td>
</tr>
<tr>
<td>d(cp(-1))</td>
<td>-0.010</td>
<td>0.0129</td>
<td>-0.885</td>
<td>0.381</td>
</tr>
<tr>
<td>d(cp(-2))</td>
<td>-0.008</td>
<td>0.01290</td>
<td>-0.739</td>
<td>0.464</td>
</tr>
<tr>
<td>d(er(-1))</td>
<td>-0.124</td>
<td>0.1087</td>
<td>-1.164</td>
<td>0.251</td>
</tr>
<tr>
<td>d(er(-2))</td>
<td>-0.149</td>
<td>0.1094</td>
<td>-1.375</td>
<td>0.177</td>
</tr>
<tr>
<td>d(y(-1))</td>
<td>0.005</td>
<td>0.0165</td>
<td>0.326</td>
<td>0.745</td>
</tr>
<tr>
<td>d(y(-2))</td>
<td>0.018</td>
<td>0.0170</td>
<td>1.081</td>
<td>0.286</td>
</tr>
<tr>
<td>d(tr(-1))</td>
<td>0.718</td>
<td>0.28240</td>
<td>2.553</td>
<td>0.015</td>
</tr>
<tr>
<td>d(tr(-2))</td>
<td>-0.958</td>
<td>0.24661</td>
<td>-3.892</td>
<td>0.001</td>
</tr>
<tr>
<td>ECT(-1)</td>
<td>-0.804</td>
<td>0.162</td>
<td>-4.947</td>
<td>0.000</td>
</tr>
</tbody>
</table>
Factors affecting demand for real money and international capital movement in Pakistan: an analysis

The findings regarding Eq. (2) are depicted in Table 6 above. The lagged error correction term (ECT) with a specific value and sign is interpreted to present the short-run dynamics.

Figure 3. Responses of money demand and regressors

![Graph showing responses of money demand and regressors](image)

The negative value of the ECT is significant even at the 1% level. Furthermore, the value of the ECT coefficient is –80.4, which shows the speed of adjustment to the long-term equilibrium. In other words, within almost one year, 80.4% of the disequilibrium returns to the long-term equilibrium. Lag periods of m, cint, y and tr have positive and significant impacts on m. However, cp and er negatively affect m in the first and second lags. For that reason, it may be concluded that the overall impact of er, cint, y, tr and cp on m is time variant. These results are somewhat analogous to the findings of Alam et al. (2012) and Mohapatra and Giri (2015). Nevertheless, the findings are contradictory to those of Chebbi and Boujelbeane (2008).
It is observed in the first panel of Figure 3 that m responds to a shock to itself, and the response is initially high and significantly positive. Later, it has a decreasing trend. Nevertheless, the response becomes negative thereafter and remains above the boundary line between 6 and 10 years later. In the second panel of the figure, er responds to a shock in m, and the response remains positive throughout the period. Similarly, er responds to a shock in cint, and the response remains positive throughout the study period. In the third panel of the figure, cp responds to a shock in m, er, tr and cint, and the response remains positive except for GDP. In the fourth panel, cint responds to a shock in er and tr and the response remains negative, while the responses to shocks in y, m and cp remain positive. In the last panel of the figure, GDP responds to a shock in cint, m, tr, er, and cp, and the response remains on the boundary line throughout the period of research.

5. Conclusions

This paper estimates impact of the international interest rate, income, reserves, inflation rate and domestic exchange rate on real money demand in Pakistan by using econometric techniques. The Box-Cox technique shows that the double-log form is accepted at the 1% level; nevertheless, the linear form cannot be accepted at the 1% level. The OLS regression technique measures the covariance of variables. The estimated outcomes demonstrate that real income and the demand for money decrease or increase in the same direction, but the effect is insignificant. A high interest rate causes the value of domestic currency to appreciate, while high levels of the international interest rate and of expected inflation decrease the demand for real money. These results do not correspond with those of Fase (1998), who showed that money demand increases with high stock prices; however, the study of Bahmani (2002) showed that currency depreciation decreases demand for money in Thailand. The latter author also suggested that money demand in Hong Kong increases with a high foreign interest rate. Future research may be conducted in the different areas of international interest rates.

References


Huchet-Bourdon M., Bahmani-Oskooee M. (2013), Exchange rate uncertainty and trade flows between the United States of America and China; the agricultural versus the nonagricultural sector, The Chinese Economy, 46, 29-53.


