IS THERE A ROLE OF HUMAN CAPITAL IN MONETARY AGGREGATES - EVIDENCE FROM SOUTH ASIAN COUNTRIES

[a]SABA ANWAR ,[b]SADIA SAFDAR, [c]IHTSHAM UL HAQ PADDA

[a] PhD Scholar, Department of Economics, Federal Urdu University of Arts, Science and Technology, Islamabad. Zero Point ‹Khayaban-e-Suhrwardy, 7/1 G 7/1 G-7, Islamabad, Islamabad Capital Territory 44000, Pakistan
[b]Assistant Professor, Department of Economics, Federal Urdu University of Arts, Science and Technology, Islamabad. Zero Point ‹Khayaban-e-Suhrwardy, 7/1 G 7/1 G-7, Islamabad, Islamabad Capital Territory 44000, Pakistan
[c]Head and Assistant Professor, Department of Economics, Federal Urdu University of Arts, Science and Technology, Islamabad. Zero Point ‹Khayaban-e-Suhrwardy, 7/1 G 7/1 G-7, Islamabad, Islamabad Capital Territory 44000, Pakistan
Email: [a]saba@pide.org.pk, [b]sadiya.patka13@gmail.com, [c]ihtsham91@yahoo.com

Abstract: The paper addresses the money demand function for three South Asian countries India, Pakistan and Sri Lanka. The theoretical underpinnings are derived from portfolio demand for money. This explains the role of human wealth as a determinant of demand for money in addition to the traditional scope and scale variables. The johansen cointegration test confirms the existence of long run relationship between real demand for both narrow (M1) and broad money (M2) and human capital index along with other determinants. The long run and short run elasticities reinforce the significant relationship between money demand, income, interest rate, inflation rate and human capital in a dynamic framework. The cusum and cusumsq confirms the stability of the money demand function even after the introduction of structural breaks.

Keywords: Demand for Money, Human Capital, Johansen Cointegration.

1 Introduction

In the restatement of Quantity theory of Money (QTM) in 1956, Milton Friedman emphasized that the theory is not a theory of output, money income or price level, it is the theory of money demand. The real cash balances demanded by the wealth holders are a commodity because they provide services to the wealth holders. Hence money was regarded as asset and capital good, thereby making the demand for money a part of capital or wealth theory. The wealth thus was regarded as an important determinant of demand for money amongst other determinants. Friedman further reinstated that numerous demand studies for money have shown that some concept of permanent real income or wealth is more closely connected with the real quantity of money demanded than is current income. The wealth was further bifurcated into human and non human component of wealth. Money, physical assets and nominal-value assets fell into non human wealth. While human wealth referred to the productive capacities of the human beings (Peng et al, 2017).

Historically, most of the research on the demand for money up until 1980s was carried out by the so-called partial adjustment models in which demand for real money is formulated as a function of a scale variable and a vector of opportunity cost variables. The demand for money models built under this framework for the United States and industrial countries using post World War II data indicated that the demand for money was unstable in the 1970s, which is commonly referred to as the “missing money episode”. The “missing money episode” was due to the assumption of a stable velocity and misspecification of the model. On the policy front, it made most of the industrial countries to abandon the monetary aggregate targeting policy framework in favour of inflation targeting. However, in the recent past, this view has changed, consequently, considerable effort has been made in the empirical literature to determine the relation between the long-run demand for money and the key economic factors and the stability of the relationship between these factors and various monetary aggregates. These include among others, (Carlson et al, 2000) for the US, (Hendry & Ericsson, 1991) for the UK and (Hoffman et al, 1995) for the US, Japan, Canada, the UK, and Germany.

There is no dearth of literature on the determinants of demand for money which addresses the specification of the model and discusses the magnitude of the coefficients and their stability. The debate remains inconclusive, as the technological innovation in the monetary sector turns notes and coins and semiliquid money like cheques into card money. A glimpse of the literature pertaining to three countries is as follows.

The responsiveness of demand for money for scale and opportunity cost variables has yielded varied results in different studies conducted for Pakistan. For M2, (Cornelisse & Mertens, 1989) found that the real demand for money is sensitive to call money rate, monthly GNP and expected price increase. Mall, 2013: Fry, 1973: Akhtar, 1974: Khan & Raza, 1989) found the real income to be the significant determinant of demand for money. (Mall, 2013: Hassan et al, 2016) found foreign exchange rate to be another determinant of demand for money both in the long and the short run. Akhtar, 1974: Khan, 1982: Khan & Raza , 1989) found that demand for money is also influenced by interest rate. Fry found expected rate of inflation to be an important determinant while (Khan, 1982: Burney & Akmal, 1990) found that the variability of the expected rate of inflation does not affect the demand for money. (Khan et al, 2000) in a disaggregated analysis found that the narrow demand for money is sensitive to income only while the interest rate significantly affects the demand for broad money while vice versa was observed by (Sarwar et al, 2013, Hassan et al, 2016) rural and urban population shares significantly increase money demand in Pakistan. (Sarwar et al, 2013) found the financial development as an important indicator of demand for money. (Shafiq & Malik, 2018) found that asset price is an important variable that explains demand for money in Pakistan. In case of India, (Arrau et al, 1995) found that the role of financial innovation whether stemming from the introduction of new liquidity services, from a secular process of dollarization, or from regulatory changes is quantitatively important in determining demand for money. (Kulkarni & Yuan, 2006) concludes that the demand for money in India is not effected by the openness policy. (Bharadwaj & Pandit, 2010) concludes that an increase in the real exchange rate stimulates demand for domestic money stock in contrast to the situation that prevailed in early 60s and 70s. (Sahadudheen, 2012) found little evidence for the basic contention that exchange rates have a significant influence on real money demand. In case of Sri Lanka, Iftikar et al (2017) analysis of the determinants of demand for money for Sri Lanka revealed that in the long run per capita GDP, budget deficit, interest rate and exchange rate effect the M2 demand for money. In the short run, the per capita GDP and fiscal deficit remained significant determinants in case of Sri Lanka. reported that highly significant negative coefficient for real effective exchange rate shows that depreciation of the domestic currency increases the value of foreign assets owned by domestic residents, hence, increases the demand for domestic currency (Carr & Darby, 1980: Meltzer, 1963)

The analysis of the sensitivity of the income and interest rate elasticities and their magnitude to different specifications has yielded multiple results for the three countries. The interest elasticity was insignificant by (Hasan, 1987: Khan, 1980) in case of nominal M1 and M2 and significant in case of (Khan, 1980), The magnitude was smaller in short run and higher in long run Mall, 2013: Akhtar, 1974) found that the interest elasticity was high but not substantially different for two definitions of money M1 and M2. The evidence on the substitution hypothesis revealed that the income elasticity was high and differs substantially for both M1 and M2 (Mall, 2013). revealed that for real demand function, both for M1 and M2, the measured and permanent income elasticities were higher than the ones obtained through the nominal demand function. In another study (Khan, 1980) observed that the results for M1 and M2 were the same. In (Khan, 1982) the long run income elasticity for M2 is greater than the M1. (Khan et al, 2000) found the unit income elasticity for the broad money. In case of India, (Gujarati, 1968) found the income elasiticity was greater than unity in the long run, but the magnitude was smaller in the short run. The interest elasticity was insignificant in both cases (Gupta, 1970) found results contrary to (Gujratai, 1968). The authors found that the demand for M1 in India is interest elastic (Sharma, 1978) revealed that the income elasticity of M1 was about 1.5 and the interest elasticity was between 0.61 and 0.69. (Rao & Shalabh, 1995) and Kulkarni and found similar results. (Bhattacharya, 1974) concluded that for M2, the income elasticities at sample mean levels are 0.47 and 0.52, respectively and considerably lower than unity. In case or Sri Lanka, (Valadkhani & Alauddin, 2003) found that the long-run income elasticity for M2 are greater than unity for Sri Lanka and is less than unity.

Regarding the stability of demand for money the empirical investigations remains inconclusive. (Qayyum, 2005: Mall, 2013: Hassan et al 2016: Tariq & Matthews, 1997: Shafiq & Malik, 2018) using CUSUMSQ and CUSUM statistics showed that the demand function was stable for the period of analysis. Whereas (Ahmad & Khan,1990) found that the money demand function was unstable for both M1 and M2 for the period 1959-60 to 1986-87. Further investigation by adding one fiscal year each time after 1968-69 to 1986-87 revealed that money demand corresponding to M1 is unstable after 1970-71 and money demand corresponding to M2 remained stable till 1979-80 and then became unstable. Sarwar et al (2013) found unstable M1 and a stable demand for M0 and M2. In case of India, (Padhan, 2011) found the demand to be slightly unstable between 2005 and 2006. In (Bharadwaj & Pandit, 2010) the demand for broad money was found to be more stable than narrow demand for money. In (Pradhan & Subramanian, 2002), possibility of regime shifts suggests lack of stability in the demand for M1 (Rao & Shalabh, 1995) showed that the money demand function was stable during the period. In (iftikar et al, 2017), the CUSUM and CUSUMSQ tests revealed that the demand function for M2 was stable over the period under analysis. In (Alessi, 1966) the authors concluded that the demand for M2 was not stable.

The brief overview of the literature accentuates why despite the widespread view that the quantity of money is unimportant to central bankers, research on the demand for money has continued [Duca and Vanhoose (2004)]. The contribution of this study to this ongoing debate is a question that posits is there a role of human capital in demand for monetary aggregates. Friedman gave more importance to wealth in determining the demand for money. He divided wealth in to two components, the human and non human wealth. According to this approach wealth can be held in five different forms: money, bonds, equities, physical goods, and human capital. Each form of wealth has a unique characteristic of its own and a different yield. To date, the human capital component of wealth and its effect on demand for money remained entirely unexplored because of difficulties in quantifying the human wealth (Gerdesmeier, 1996). As pointed out by Knell and Stix (2006), despite the existence of a number of theoretical approaches that suggest the inclusion of (financial or human capital) wealth as an additional explanatory variable for money demand, only a minority of studies follow this suggestion. This study is based on a theoretical model [Anwar et al (forthcoming)] and the Friedman discussion on human capital as follows (Friedman, 1956)

2 Model Specification

According to Friedman, wealth can be kept in five different forms i.e. money, bonds equities, physical non human goods and human capital. Consider now the yield on each.

i) The yield of money is the ease and liquidity etc. The magnitude of this return in real terms per nominal unit of money is directly proportional to the volume of goods that unit corresponds to, or on the general price level, which is given as P.

ii) The nominal income stream purchased for \$ 1 worth of a bond at time zero is given as

$$r_b - \frac{1}{r_b}\frac{dr_b}{dt} \tag{2.1}$$

v) Similarly the nominal income stream of \$ 1 worth of an equity at time zero is given as

$$r_e + \frac{1}{P}\frac{dP}{dt} - \frac{1}{r_e}\frac{dr_e}{dt} \tag{2.2}$$

iv) The physical goods are similar to equities so their yield is the same as equities except that the yield is in terms of satisfaction rather than money. The nominal value of the yield, at time zero is given as

$$\frac{1}{P}\frac{dP}{dT} \tag{2.3}$$

i) The yield on human capital is defined as w. Since this form of wealth of an individual could not be expressed in terms of market price or rate of return so it could not receive a lot of attention. Still, he included human wealth in his portfolio of assets. Hence w was defined as the ratio of non human to human wealth, or of income from non human wealth to income from human wealth.

Combining these yields gives us the following demand function.

$$M = f(P,\ r_b - \frac{1}{r_b}\frac{dr_b}{dt}, r_e + \frac{1}{P}\frac{dP}{dt} - \frac{1}{r_e}\frac{dr_e}{dt},\ \frac{1}{P}\frac{dP}{dT},\ w,\ \frac{Y}{r}, \mu) \tag{2.4}$$

Whereas per Friedman, Y refers to the return to all forms of wealth other than money held by the individuals and so $\frac{Y}{r}$ is the total remaining wealth. A number of observations about this demand function are explained by Friedman are as follows.

i)"The general interest rate, r is interpreted as weighted average of the r_b and $r_e$the rates applicable to the human wealth and to physical goods. Since the latter two cannot be observed directly thus the general rate is dropped, assuming that that its impact is taken into account by r_b and r_e.

ii) Assuming that there were no differences of opinion about price movements and interest rate movements and the bonds and equities are considered equivalent except that the former is expressed in nominal units, arbitrage would make

$$r_b - \frac{1}{r_b}\frac{dr_b}{dt} = r_e + \frac{1}{P}\frac{dP}{dt} - \frac{1}{r_e}\frac{dr_e}{dt} \tag{2.5}$$

as the rates of interest are either stable or changing at the same percentage rate, the interest rate on money is given as the sum of real rate and the percentage change of prices.

$$r_b = r_e + \frac{1}{P}\frac{dP}{dt} \tag{2.6}$$

iii) The M is homogeneous of degree one in prices and income.

The equation (2.4) can thus be written as

$$f(\lambda P, r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, \lambda Y, \mu) = \lambda f(P, r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, Y, \mu) \tag{2.7}$$

Alternatively,

$$\frac{M}{Y} = f(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, \frac{P}{Y}, \mu)$$

$$= \frac{1}{v(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, \frac{Y}{P}, \mu)}$$

or

$$Y = v(r_b, r_e, \frac{1}{P}\frac{dP}{dt}, w, \frac{Y}{P}, \mu) \cdot M" \tag{2.8}$$

The equation (2.8) is the usual quantity theory of money where v is the income velocity. With the theoretical framework of Quantity Theory of Money, the money demand functions to be estimated are specified as follows. This study takes w as the productive capacity of the human being as defined by Friedman.

1.Demand for M1

$$M_{it}/P_{it} = f(Y_{it}/P_{it}, R_{it}, INF_{it}, HK_{it}, \mu_{it}) \tag{2.9}$$

2.Demand for M2

$$M_{it}/P_{it} = f(Y_{it}/P_{it}, R_{it}, INF_{it}, HK_{it}, \mu_{it}) \tag{2.10}$$

3 Estimation Technique

According to Granger Representation Theorem (Engle and Granger, 1987), if in the long run stable relationship exists among the non-stationary variables then the dynamic model can be described by Error Correction Model (ECM). The estimation strategy to obtain money demand function consists of three steps. The first step addresses the stationarity and non-stationarity of individual series by applying Augmented Dickey Fuller (ADF) unit root test. Having established the stationarity of the variables, the long run money demand function is estimated by applying the maximum likelihood method. Lastly, a dynamic short money demand function is obtained through the error correction mechanism using ordinary least square (OLS). Further Chow's (1960) analysis of variance test is used, along with Brown, et al. (1975) CUSUM and CUSUMSQ) tests, to test the stability of the estimated model (Basutkar, 2016).

3.1 Johansen Juselius Cointegration

"The concept of cointegration is a powerful one because it allows us to describe the existence of an equilibrium, or stationary, relationship among two or more time series, each of which is individually non stationary. [Banerjee et al. (1993)]". Granger (1981) introduced the theory of cointegration. It was further elaborated by two step procedure in Engle and Granger (1987). The procedure mainly dealt with one cointegrating relationship between two variables. It could not be applied in case of multiple contegrating realtionships between more than two variables. Later, Johansen (1988) and Johansen and Juselius (1990) proposed a residual based test for cointegration which could address more than one cointegrating relationships in multivariate macroeconomic models. Since there are more than two variables, the long run relationship between demand for money and its determinants is analyzed by applying Johansen Maximum Likelihood method. The Johansen procedure starts for vector autoregressive model of the form

$$X_t = \sum_{i=1}^{k} \Pi_i X_{t-1} + \mu + \varphi D_t + \varepsilon_t \; t = 1,2 \ldots .T \tag{3.1}$$

Where X_t is vector of variables included in the model. The error term ε is iid (0, A) disturbance term. μ is a vector of constant terms and D consists of dummies. From this general model, the dynamic error correction model can be deduced using lag operator,

$$\Delta X_t = \sum_{i=1}^{l-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \mu + \varphi D_t + \varepsilon_t \tag{3.2}$$

Where $i = 1,2, \ldots l-1$ is the lag length, $\Gamma_i = -(I - A_1 - \cdots - A_i)$ is the short run dynamic coefficient, $\Pi = I - (A_1 - \cdots - A_L)$ is a $(k * k)$ matrix containing long run information. The number of cointegrating vectors $((r)$ is determined by the rank of Π matrix. If matrix has full rank p then X_t is a stationary process, if it is zero then there is no long run information in the data and if the rank $(\Pi) = r$, where $0 < r < p$, there exits r cointegrating relationships between the variables. In this case, the Π matrix is further decomposed into two matrices as $\Pi = \alpha\beta'$. The error correction or adjustment coefficients are reported in α which is a $(k * r)$ matrix, while the long run cointegrating vectors are reported by β' which is a $(r * k)$ matrix. Similarly, the μ vector is further decomposed into $\mu = \mu_1 + \delta_1 t + \mu_2 + \delta_2 t$. The μ_1 and $\delta_1 t$ are the vectors of constant and trend coefficients in the long run cointegrating equation. The μ_2 and $\delta_2 t$ are the vectors of drifts and trend coefficients in the short run vector auto regressive (VAR) model. Incorporating this information in equation 4.3 gives us

$$\Delta X_t = \sum_{i=1}^{l-1} \Gamma_i \Delta X_{t-i} + \alpha \begin{bmatrix} \beta \\ \mu_1 \\ \delta_1 \end{bmatrix} X_{t-1} + \mu_2 + \delta_2 t + \varphi D_t + \varepsilon_t \tag{3.3}$$

The literature discusses five models for appropriate treatment of deterministic components. These include (Johansen & Juseliu, 1990: Johansen, 1991: Hendry, 1995: Enders, 2004) amongst others. The study uses the (Pantula, 1989) principle to determine the trend specification for the cointegration equation. The Pantula Principle compares the most restrictive model with the least restrictive one. The trace statistics are compared with the critical values at each stage.

The existence of the number of cointegrating vectors can be determined using trace test or maximum eign value test. The null of trace test is given as $H_0: rank\ (\Pi) \leq r$, where $0 \leq r \leq \rho$ and ρ is the full rank. It is tested against the alternative hypothesis of $H_A: rank\ (\Pi) > r$. The trace statistics is given as

$$\lambda_{trace\,(r)} = -T \sum_{i=r+1}^{k} \ln(1 - \lambda_i) \tag{3.4}$$

Where λ_i is the eigenvalues of Π matrix.

In case of maximum eignvalue test, the null hypothesis of $H_0: rank\ (\Pi) = r$ is tested against the alternative hypothesis of $H_A: rank\ (\Pi) = r + 1$. The likelihood ratio test statistic for the hypothesis that there are at the most r cointegrating vectors is given as

$$\lambda_{max\,(r,r+1)} = \lambda_{trace\,(r)} - \lambda_{trace\,(r+1)} = -T \ln(1 - \lambda_{r+1}) \tag{3.5}$$

The critical values for both the tests are provided by (Johansen & Juselius, 1990).

In addition to learning about the long run relationship between the variables, the cointegration enriches the analysis by providing a particular kind of dynamic short run model based on long run coefficients. The residuals of the long run model are an important component of error correction model. These residuals are known as error correction terms. The short run equation uses the first lag of these residuals. They measure the divergence form the equilibrium and also provide the speed of adjustment. The existence of $\in_{t-1}$ in the short run indicates that the adjustment to long run variables is not instantaneous. The adjustments are made in the short run to overcome long run disequilibrium. Theoretically, the error correction terms should be negative and significant to validate the long run relationship.

Using Hendry's general to specific approach (1992), the short run coefficients are obtained. In this approach we first construct a general model. The general model contains all the lags of the dependent and independent variables in differnces, dummies and the lag of error term. The specific model is derived by eliminating the most insignificant regressors form the general model. The specific model should satisfy diagnostics tests like Langrange Multiplier Test of Bruesh (Godfrey, 1978). This test is used to check the existence of serial correlation in the residual of error correction term. The specific model should also satisfy the Engle's ARCH LM test to ensure that there is no autocorrelation conditional heteroscedasticity in the residuals of the error correction term. The stability of the specific model can be tested through Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Square of Residuals test (CUSUMSQ) introduced by Brown, Durbin and Evan (1975). The CUSUM test statistic is given as

$$CUSUM_t = \sum_{j=k+1}^{t} \frac{\hat{w}_j}{\hat{\sigma}_j} \quad (3.6)$$

$$\hat{\sigma}_w^2 = \frac{1}{n-k} \sum_{t=1}^{n} (w_t - \bar{w})^2$$

The CUSUMSQ test statistic is given as

$$CUSUMSQ_t = \frac{\sum_{j=k+1}^{t} \hat{w}_j^{\,2}}{\sum_{j=k+1}^{n} \hat{w}_j^{\,2}} \quad (3.7)$$

If β changes, the w_t will tend to diverge from zero mean value line. The significance of divergence is analysed by the 5 % significance lines. Any movement of w_t outside critical lines suggests that the parameters are unstable. The difference between CUSUM and CUSUMSQ test is that the former tracks the regular changes in the parameters, while the latter elucidates sudden withdrawal from normalcy.

4 Data and Construction of Variables

The period under analysis ranges from 1960 to 2018. The annual series of narrow money M1, broad money M2, the yield on government bonds and rate of interest on bank deposits is taken from International Financial Statistics (various issue). The annual series of gross domestic product (GDP) and consumer price inflation (CPI) is taken from the World Development Indicators (WDI). The annual series of human capital index draws from the Penn World Table (PWT). According to the literature, the PWT series of human capital index is based on the average years of schooling from (Barro & Lee, 2013) and an assumed rate of return to education, based on Mincer equation estimates around the world (Psacharopoulos, 1994). This is challenging as data required to construct index is very inconsistent. In order to obtain information on the average years of schooling, the data is extracted from population census and combined with school enrollment data. The PWT 9.0 combines both (Barro & Lee, 2013) and the (Cohen & Leker, 2014) alternative dataset for average years of schooling. The human capital index is computed as follows

$$\phi(s) = \begin{cases} 0.134\,.\,s & \text{if } s \le 4 \\ 0.134.4 + 0.101\ (\text{s-4}) & \text{if } 4 < s \le 8 \\ 0.134 \cdot 4 + 0.101 \cdot 4 + 0.068(s-8) & \text{if } s > 8 \end{cases}$$

where s is the average years of schooling from either dataset.

The narrow money (M1), broad money (M2), real gross domestic product and human capital index have been transformed into natural log. One of the objectives of taking natural log is to smooth out the time series and reduce the impact of outliers [Madalla (1992)]. The interest rate, inflation rate and the long term government bond yield are taken as such.

5 Results

Following the estimation technique outlined in 2.2, the results of the Augmented Dicky Fuller Test are reported in table 1. Thus all the series are therefore integrated of order 1. The trace test and the maximum eign value tests are used to determine the number of cointegrating vectors. The results are conflicting for narrow money of India and Sri Lanka, and for broad money of Pakistan and Sri Lanka. However, this contradiction generally appears and has been observed in many cases. In case of such situation, the trace test is preferred following (Johansen & Juselius, 1997: Enders, 2014). The trace test is believed to hold more power as compared to maximum eigenvalue test (Kasa, 1992). The existence of cointegrating vector indicates the existence of a long run relationship between the determinants of real narrow and broad money. In other words, the stochastic trend in the real money balances is related to the stochastic trends in the real income, deposit rate, inflation rate and human capital index. The long run coefficients are obtained by using the appropriate lag structure identified in the earlier section. The results of the long run cointegrating vector for narrow and broad money is presented in table 1 and 2 respectively.

Table 1: Long Run Coefficients of Narrow Money

Variables	Pakistan	India	Sri Lanka
lrgdp	1.573222	0.377652	0.699602
lhc	1.033506	2.855596	1.118659
depo	-0.018081	-0.12	-0.031911
inf	-0.010137	-0.0101978	-0.012581

The signs of the coefficients are as per the theoretical expectations. The demand for real money balances are more income elastic in Pakistan as compared to India and Sri Lanka. The high consumption per gross domestic product has been the highest in case of Pakistan during the observed time period. The high propensity to consume leads to high sensitivity of the real money holdings with respect to income. The low responsiveness of money demand with increase in income has been observed in India and Sri Lanka. Both these countries have lower consumption per gross domestic product than Pakistan. In case of India, during the period of analysis, there is continuous declining trend in household consumption per gross domestic product. As human capital increases by one percent the demand for real narrow money increases unvaryingly. The elasticity of money demand with respect to human capital is highest in case of Sri Lanka as compared to India and Pakistan. Thus as this form of wealth increases the representative agent may desire to increase his holding of broad money by an equal amount. This has been discussed by Friedman, (Cagan, 1956). As the theoretical model [Anwar et al (forthcoming)] points out, income is a function of human capital. Since with more human capital, the individual can earn more income. Thus as real income increases, the individual can afford to hold more of liquid money. We can also say that as the rate of return to education increases, the individual is inclined to invest more in human capital as compared to other assets. This leads to an increase in the demand for real money balances. Interestingly, the literacy rate is the highest in Sri Lanka during the period of analysis which explains the high elasticity. The deposit rate and the inflation rate negatively affect the demand for real narrow money. The increase in the deposit rate inclines the individuals to substitute the real narrow money for bank deposits that have a higher rate of return as compared to the liquid money. Thus the desired real cash balances decreases. However, the magnitude is small as compared to income elasticity. Similar observations were made by (Ahmed & Rafiq, 1987), Goldfeld et al, 1973: Hasan, 1987: Akhtar, 1974: Khan, 1980). The nonexistence of financial markets outside commercial banks leads to little or no substitutability between money and other assets. The low level of financial literacy also leads to low interest elasticity of money balances. The increase in general price level leads to a decrease in value of real money balances. Thus higher inflation instigates the individuals to bring about a portfolio change. The individuals then substitute real assets for narrow money and financial assets. Thus the individual prefers to hold less of liquid money. The dummy variables enter as exogenous variables in the cointegration equation. Similar is observed in the case of broad money as shown in table 2.

Table 2: Long Run Coefficients of Broad Money

Variables	Pakistan	India	Sri Lanka
lrgdp	1.432987	0.367054	1.351252
lhc	1.08079	0.947651	1.41756
depo	0.04426	0.147381	0.020411
inf	-0.02205	-0.054581	-0.040744

The signs of the coefficients are as per the theoretical expectations. Still, two results are worth noting. The demand for real broad money balances are more income elastic in Pakistan and Sri Lanka as compared to India. There is unit elasticity of real broad money with respect to human capital in case of Pakistan and India. The elasticity is highest in case of Sri Lanka. The continuous decline in the level of employment in Sri Lanka during the period under observation explains the high elasticity. The individuals are inclined to invest in human capital as compared to physical assets with long term yields. The deposit rate positively effects the demand for broad money. The increase in the deposit rate provides an inclination to the individual to increase the demand for broad money which includes saving deposits. Secondly, the broad money thus yields a greater return to the individual. Thus the desired level of broad money increases. The positive correlation between short term interest rate and broad money was also observed by Knell and Stix (2006). The positive relationship was also reported by Khan et al (2000) for quasi money and by Khan and Hye (2013). The magnitude is smaller than real income. Thus the demand for real money balances is less interest elastic.

The short run dynamic error correction model (ECM) of the demand for real narrow and broad money. The residuals of the long run cointegrating function, known as error correction terms (ECM) are an important determinant of the short run equation. These measure the divergence between two periods and also give the speed of adjustment towards equilibrium path. The ECM is estimated by Ordinary Least Square (OLS) following Hendry's "general to specific "strategy (1992). The general model is presented in the first difference of all the variables. These are obtained by analyzing the residuals of the general model. The general model also contains the lag of error correction term, the lags of real money balances, the real income, human capital index, deposit rate and inflation rate. The specific model is obtained by dropping the insignificant variables. The resultant model is given as follows.

Table 3: Short Run Coefficients of Narrow Money

Variables	Pakistan	India	Sri Lanka
ecm(-1)	-0.094792* (0.0490)	-0.01246* (0.0678)	-0.108170* (0.0634)
Δlrm1(-1)	0.125070* (0.0280)		0.460553* (0.0021)
Δlrm1(-2)			-0.258653* (0.0131)
Δinf	-0.003300 (0.0119)*	-0.001470* (0.0102)	-0.003376* (0.0095)
Δinf(-1)		-0.004297* (0.0000)	
d81	-0.068903* (0.0209)		
d82	0.057178* (0.0728)		
d97	0.084393* (0.0046)		
c	0.003050 (08808)	0.042524* (0.0000)	0.067913 (0.1728)

**indicates significance at 5 percent level*

The ECM is negative and significant in all the cases, thus indicating dynamic adjustment of all variables towards equilibrium. The coefficient indicates a very slow adjustment to the equilibrium. In case of narrow money, the lags of real narrow money balances are significantly effecting the demand for current narrow money in case of Sri Lanka and Pakistan. In case of India, the one period and two period lags of inflation significantly effect the demand for narrow money. The short run coefficients of broad money are reported in table 3.

Table 4: Short Run Coefficients of Broad Money

Variables	Pakistan	India	Sri Lanka
ecm(-1)	-0.065324* (0.0269)	-0.072483* (0.0024)	-0.084636* (0.0066)
Δlrm2(-1)			0.355429* (0.0089)
Δlrm2(-2)	-0.306464* (0.0007)		0.343150* (0.0189)
Δlrgdp(-2)			0.162701* (0.0946)
Δlhc	0.864501* (0.0062)		
Δdepo(-1)		0.015641* (0.0381)	
Δinf	-0.002469* (0.0138)	-0.004667* (0.0015)	-0.003204* (0.0103)
d72	0.245580* (0.0000)		
d81			0.069003* (0.0184)
d06		0.4364* (0.0471)	
c	0.050425* (0.0000)	0.088868* (0.0000)	-0.055701* (0.0681)

**indicates significance at 5 percent level*

The ECM is negative and significant in all the cases, thus indicating dynamic adjustment of all variables towards equilibrium. The coefficient indicates a very slow adjustment to the equilibrium. In case of broad money, the lags of real broad money balances are significantly effecting the demand for current broad money in case of Sri Lanka and Pakistan. The human capital index and lag of real income also contribute in achieving long run equilibrium in case of Pakistan and Sri Lanka respectively. In case of India, the one period lags of deposit significantly effect the demand for broad money. The inflation brings about significant adjustment in all three countries in the short run. The residuals of the short run equation are tested through the standard diagnostics tests.

The stability of the parameters can be seen from the CUSUM and CUSUMSQ graphs as shown below. The parameters are stable. Similar results were obtained by (Qayyum, 2001, 2005).

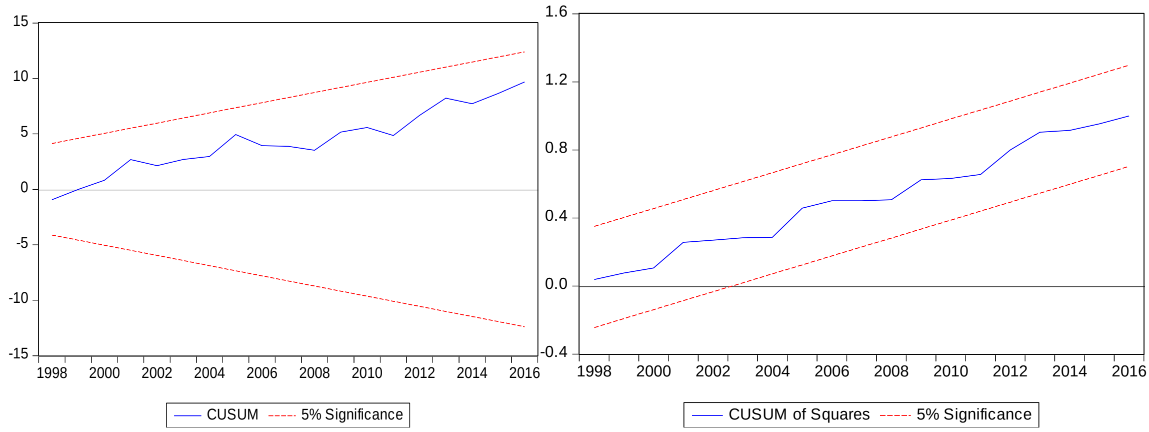

Fig 1: CUSUM and CUSUMSQ of LRM1 for Pakistan.

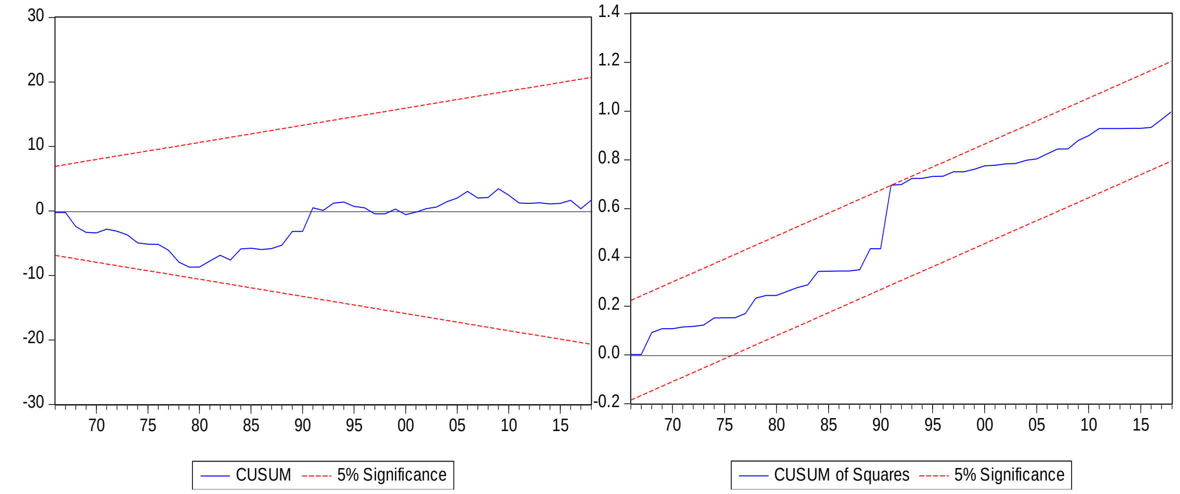

Fig 2: CUSUM and CUSUMSQ of LRM1 for India

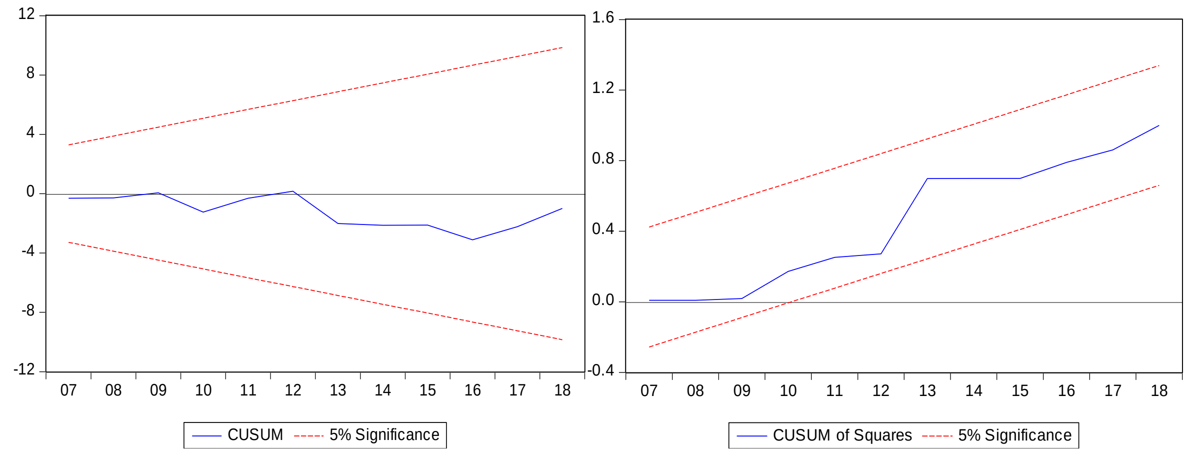

Fig 3: CUSUM and CUSUMSQ of LRM1 for Sri Lanka

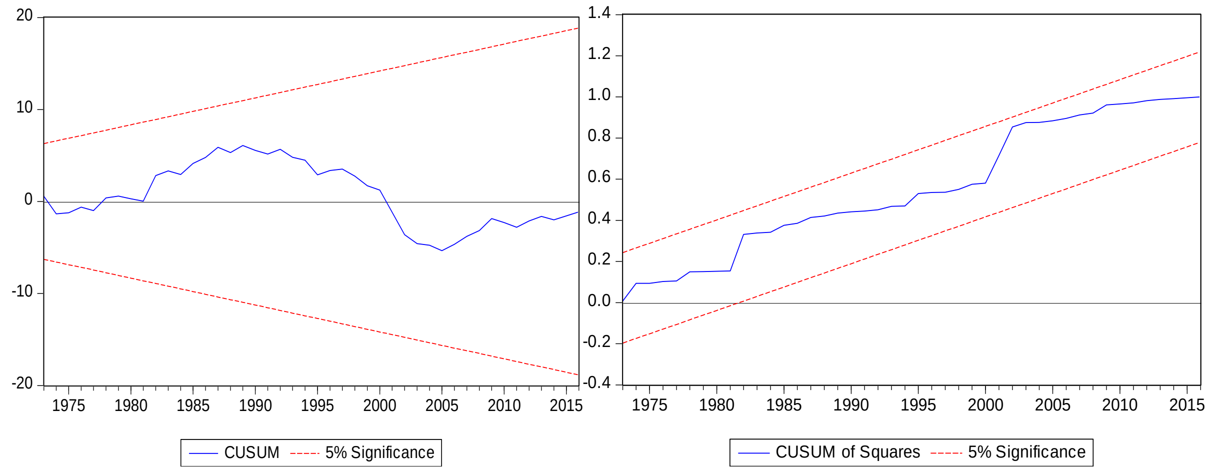

Fig 4: CUSUM and CUSUMSQ of LRM2 for Pakistan

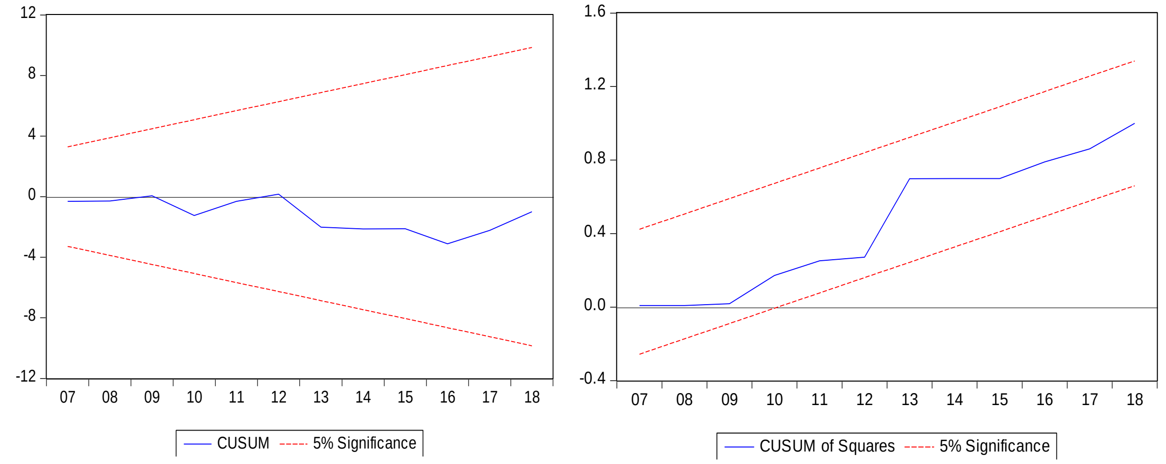

Fig 5: CUSUM and CUSUMSQ of LRM2 for India.

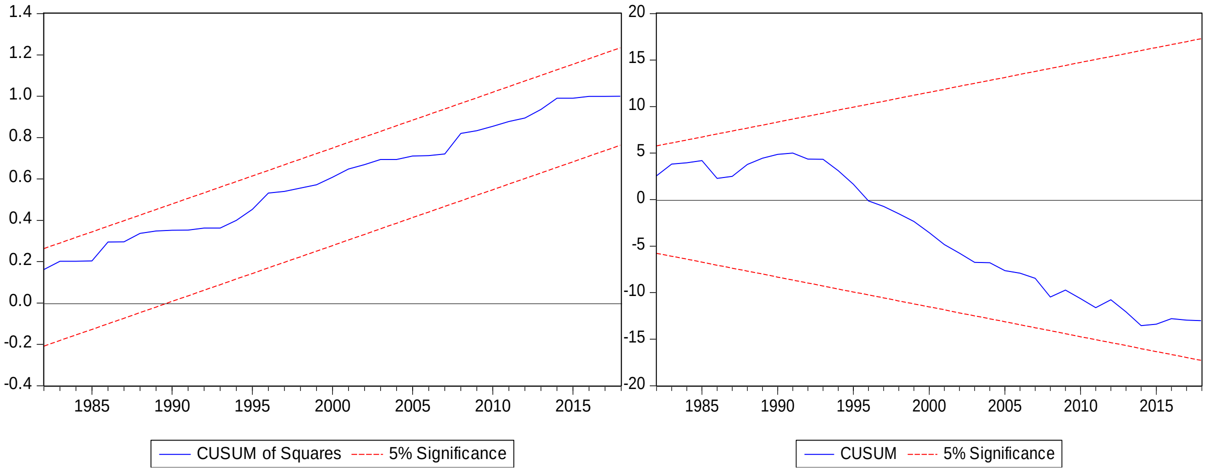

Fig 6: CUSUM and CUSUMSQ of LRM2 for Sri Lanka

"While many East Asian countries have liberalized their financial markets from the early 1980s, the South Asian countries were late starters and delayed reforms until the early 1990s. However, it is difficult to select a date for the structural break because financial reforms were not introduced by all the Asian countries at the same time and with the same intensity. Therefore, a single break date might be somewhat restrictive. (Rao & Kumar (2009). Following this, our study introduced multiple breaks for the analysis. The notable feature of the stability results is that in case of real narrow money balances, the coefficients are stable in case of India and Sri Lanka without any structural break as seen in the fig (1-6). In case of broad money, the structural breaks are significant. Interestingly, these structural break years do no pertain to years that were related to financial reforms in respective countries except for India. The significant breaks are in year 1972 for Pakistan. In india, year 2006 is significant and year 1981 in case of Sri Lanka. The year 1972 in the history of Pakistan was an unstable year owing to a border conflict with a neighboring country in 1971. In sri lanka, 1977- 82 was the period of new policy environment. The country adopted export led industrialization policy and provided incentives for foreign direct investment. There was positive external assistance in the form of high remittances. This contributed significantly to economic growth and the demand for money. The year 2006 in India is considered as the post reform period. In the post reform period the key segments of the financial markets were developed and the interest rates were de regulated. This had an impact on the monetary transmission mechanism also.

5 Concluding Remarks

The researchers have long been interested in obtaining the accurate estimates of demand for money and its stability. There is vast literature that dwells deep on theoretical linkages and latest empirical methods to achieve the objective. Theoretically, the different variables that were considered as important determinants, were channelized in the theoretical models. This helped in reducing the specification bias. Empirically, the new estimation techniques are employed to get better insights into the stability of coefficient. It is imperative for policymakers to understand the relationship between money and its determinants as it helps in ascertaining the rate of monetary expansion that is consistent with the long run price level stability. Also, the interest elasticity of money demand helps in estimation the area under the curve, which aids in assessing the welfare cost of inflation. A stable money demand function is a building block of IS_LM models which in the era of and dynamic general equilibrium models has become less significant.

Nevertheless, following Friedman, this study shown that such a standard money demand function can be augmented with the use of human capital as an important part of the total wealth that effects the demand for money. These theoretical underpinning provide us the fundamentals for empirical analysis. The study analysis the long run relationship between demand for money and its determinants for three south Asian countries India, Pakistan and Sri Lanka using annual data from 1960 to 2018.

The empirical results show that real demand for narrow and broad money is cointegrated with income, interest rate, inflation rate and human capital for all three countries. The existence of cointegration rules out the instability caused by the financial reforms of the 90s. The johansen cointegration results show that the estimated income elasticities are closed to one and the estimated effect of interest rate is negative and smaller than income. The human capital as a part of total wealth plays a significant and positive role in determining the demand for both narrow and broad real demand for money. The CUSUM and CUSUMSQ test provides interesting results. The money demand function is stable in case of real narrow money. in case of broad money balances, the stability of the function does not correlate to the financial reforms of 90s for Pakistan and Sri Lanka

The study provides motivation to use strong theoretical foundations for estimation of money demand function. These theoretical underpinnings can help in identifying non-conventional variables to the policy makers. The results are consistent with the theory and other studies, still a larger sample with more frequencies can be used for further investigation as that would help in splitting the data in the before and after reform periods or for step by step analysis of parameter stability.

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