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Sectoral Analysis of the Demand for Real Money Balances in Pakistan

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1. INTRODUCTION

The main objective of monetary policy in Pakistan, as in other countries, is to achieve price stability. In order to achieve the objective of stable prices, the State Bank of Pakistan is using M2 definition of money supply as an intermediate target variable to conduct the monetary policy. This choice of target variable is based on the long understanding that only the demand for M2 monetary aggregate is stable in Pakistan.

The definition of money aggregates two main sectors of the economy that is business sector and household sector. Theories such as quantity theory, Keynesian and transactions, state that both sectors have diversified behaviour. Money demand behaviour of these sectors largely depends on the different sets of variables. Therefore the aggregation of these sectors is rather poor.

Further the research conducted in Pakistan mainly concentrated on the estimation of aggregate money demand function by using annual data. Some of the studies, however, used quarterly data. They have estimated money demand functions by disaggregating data on monetary assets basis, particularly M1 and M2. However, relatively thin literature is available on the estimated money demand function by disaggregating business and household sectors. It is argued that money demand behaviour of different sectors of the economy may be different.

In this paper the long-run cointegration relationship and the error correction model of the real demand for money in desegregated, business and personal sector, form are estimated by using quarterly data. Then the estimated error correction models are tested for structural break. The empirical importance of the real demand for money in disaggregate form is that it would provide new insight in the conduct of monetary policy in Pakistan.

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The next section gives a model of real money demand. Section 3 contains estimation methodology of the empirical models. The next two sections give estimated results from the unit root test, cointegration analysis and long run money demand functions. Sections 6 and 7 provide the dynamic models of money demand and test stability and forecasting power of the estimated models. The last section discusses conclusions and policy recommendation of the study.

2. ECONOMETRIC MODEL

For individuals, the desire to hold real money, as indicated by theories, depends upon the following variables: real income, rate of interest on deposits – own rate- bond rate, rate of inflation indicating real asset substitutions. In functional form it can be written as

$$rm^p = H(ry^p, r_d, r_b, \pi, D, u) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

With partial derivatives $H_1(ry^p)$, $H_2(r_d) > 0$ and $H_3(r_b)$, $H_4(\pi) < 0$.

The business sectors demand for money have, as predicted by the theory, different set of explanatory variables then the individual wealth holders demand for money. The important determinants of money demand are: real sales, rate of interest on deposits, rate of interest on advances, and rate of inflations. We can write demand for money by the business sector as,

$$rm^b = B(rs, r_d, r_a, \pi, D, u) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

The expected signs of partial derivatives are, $B_1(rs)$, $B_2(r_d) > 0$ and $B_3(r_a)$, $B_4(\pi) < 0$.

For the whole economy it is possible to construct aggregate demand for real money function. This transformation, however, is useful to aggregation problem. As pointed out by Friedman (1987) the individual has control on his income and portfolio adjustment. All other variables are, however, are out of individual's control. Whereas for the economy the nominal quantity of money is fixed and determinants have to adjust with available money stock. So aggregate money demand is

$$rm = L(ry, r_d, r_b, \pi, D, \varepsilon) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

and *a priori* signs of partial derivatives are, $L_1(ry)$, $L_2(r_d) > 0$ and $L_3(r_b)$, $L_4(\pi) < 0$.

Now to avoid unnecessary repetition we proceed towards the formulation of general money demand function. Our model is based on two testable propositions, first time series data are non-stationary and second the real money demand and its determinants have long run relationship between them. If the time series data are non-stationary, that is random walk and the real money demand and its determinants have long run linear (cointegrating) relationship between them then the dynamic

money demand model can be represented by the error correction mechanism.[1] One approach to formulate the dynamic error correction money demand function is Autoregressive Distributed Lag (ADL) adopted by Johansen (1988) and Johansen and Juselius (1990). It can be represented by the following function.

$$X_t = \sum_{i=1}^{k} \Pi_i X_{t-1} + \mu_t + \Phi D_t + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Where X_t is a vector of variables included in the model, μ_t is constant term, D_t is a vector of dummy variables and ε_t is *iid*$(0, \Lambda)$ disturbance term. From this model, using $\Delta=1-L$, where L is the lag operator, we can deduce the following dynamic error correction model of the real money demand

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \mu_t + \Phi D_i + \varepsilon_t \quad \ldots \quad \ldots \quad (5)$$

where

$$\Gamma_i = -I + \Pi_1 + ... + \Pi_i, \quad i = 1, 2, ...k \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

and $$\Pi = -I + \Pi_1 + \ldots + \Pi_k \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

This error correction model captures the short-run dynamics as well as long run properties of the demand for money because it includes variables both in levels and in differences. Under the assumptions all the variables included in the model are stationary. Therefore, this model can be estimated with the ordinary least square method [Granger and Lee (1989)]. However, the term $\prod$ is a cointegrating matrix, which consists of the long-run relationship among the variables of real money demand and its determinants and loading vector. The estimation of the sectoral error correction models (that is, Equation 5) and test of their stability are objectives of the study.

3. METHODOLOGY

To estimate the parsimonious dynamic error correction model the following three step methodology is being adopted. Step one explores the data generating process of the individual series. For this purpose we apply Augmented Dickey and Fuller (1979, 1981) test of unit root according to Hall's (1994) sequential rule. The ADF test is to estimate following regression equation

$$\Delta y_t = \alpha + \beta_t + \rho\, y_{t-1} + \sum_{t=1}^{n} \lambda_i \Delta y_t + \varepsilon_t$$

$$\text{for } i = 0, 1, 2, ..., n \quad \ldots \quad \ldots \quad (8)$$

[1]The relationship between the cointegration and the error correction mechanism is proved in the Granger representation theorem [Engle and Granger (1987)].

where y_t is any time series to be tested for unit roots, t is time trend and ε_t is white noise error term.[2] We test the hypothesis that $\rho = 0$ in Equation 8 by τ-test by comparing the critical values of MacKinnon's (1991).

The second step deals with the testing of null hypothesis of '*r*' cointegrating vectors (i.e., $H0(r) : rank\ (\prod) \leq r$) between the real money demand and its determinants. For this purpose we use Johansen (1988) Likelihood Ratio test, based on maximum Eigenvalue[3] and Trace statistic of stochastic matrix which are asymptotically distributed as χ^2 with r $(p-r)$ degrees of freedom. After finding significant relationship we estimate the long run cointegrating money demand functions by employing Johansen (1988) Maximum Likelihood Method.

The final step involves the estimation of the parsimonious dynamic error correction demand for money function by OLS method using general-to-specific approach. The estimation starts with the unrestricted general model having lag length of four quarters and then tested it down to achieve final form of the model. The preferred money demand function would pass a number of diagnostic tests. 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. The forecasting performance of the preferred model is judged with help of Chow's (1960) predictive failure test.[4]

The quarterly series of M2 (seasonally adjusted), the consumer price index (1985 = 100), wholesale price index (1985=100), call money rate (r_c) and the yield on government bonds (r_b) are taken from International Financial Statistics (various issue). Total deposits of private business sector, deposits of personal sector and rate of interest on bank advances are taken from the Bulletin, State Bank of Pakistan (various issues). The time series of GNP and Sales (wholesales and retail trade) are not available quarterly. The annual series of GNP and sales are taken from annual reports of IFS and interpolated into the quarterly frequency.

4. TESTING OF INTEGRATION AND COINTEGRATION

(a) Test of Integration

ADF τ-statistic is applied on the level as well as first differenced series after log transformation. The results presented in the Table 1 show that all variables, except consumer price index, are non-stationary at their levels at 5 percent level of

[2]Banerjee, *et al.* (1993) says that the lag structure in the ADF tests is *ad hoc*, it seems safest to over-specify the ADF regression.

[3]Johansen and Juselius (1990) suggests that the maximal eigenvalue test has greater power than the Trace test.

[4]Other measures of forecasting accuracy are available, such as mean square errors (MSE), mean absolute error (MAE), root mean square percentage error (RMSPE), etc.

Table 1

The ADF Test for Unit Roots: Quarterly Times Series

Name of Variable	Variable Details	Lag Length	τ_t - Ratio	Name of Variable	Lag Length	τ_t - Ratio
m	Total M2	(0)	–2.48	Δm	1	11.80
rm	Real M2	(2)	–2.27	Δrm	0	–10.53
m^p	Individual M2	0	–2.82	Δm^p	0	–12.22
rm^p	Individual Real M2	0	–2.37	Δrm^p	0	–11.11
m^b	Business M2	0	–1.80	Δm^b	0	–13.03
rm^b	Real Business M2	0	–1.29	Δrm^b	0	–12.01
Y	Income (GNP)	(5)	–2.77	Δy	3	–2.73
Ry	Real Income	(3)	–1.60	Δry	4	–6.87
y^p	Household Income	4	–2.53	Δy^p	3	–2.88
ry^p	Real Household Income	4	–2.84	Δry^p	4	–6.97
sl	Sales	5	–2.58	Δsl	7	–4.22
rs	Real Sales	3	–2.72	Δrs	4	–5.96
wpi	Wholesale Price Index	4	–1.95	Δwpi	3	–4.04
cpi	Consumer Price Index	(2)	–2.38	Δcpi	3	–3.19
π	Rate of Inflation	(3)	–3.19	$\Delta\pi$	2	–10.20
r_c	Call Money Rate	(2)	–2.10	Δr_c	1	–11.70
ra	Advances Rate	0	–1.44	Δra	0	–9.54
r_b	Bond Yield	(1)	–2.14	Δr_b	1	–11.10

Note: The 5 percent rejection region for ADF $\tau_t < -3.44$ [MacKinnon (1991)].

significance. They are I(1) series. Whereas CPI is I(2), indicating that the rate of inflation is I(1). Therefore all the series included in the analysis are random walk and require first differencing to become stationary.

(b) Test of Cointegration

In this section the existence of cointegration relationship(s) between the variables is investigated. In this process we use lag length of VAR as five quarters and three quarterly dummies as I(0) variables. The results of maximal Eigenvalue and trace statistics are given in the Table 2. For all the analyses we use 5 percent level of significance unless otherwise stated.

In aggregate money demand function it is concluded that there is one cointegrating vectors between the real money demand, real income, rate of inflation, rate of interest on deposits, rate of interest on bonds. It is found that there are two cointegrating vectors present between the real demand for money (rm^b) by the

Table 2

Johansen Maximum Likelihood Procedure: LR Tests of Cointegration

Null	Alternative	Maximal Eigenvalue	Trace
(a) The Variables Included in the Analysis are: *rm, ry, rc* and π			
$r = 0$	$r \geq 1$	56.37*	100.57*
$r \leq 1$	$r \geq 2$	24.48	44.20
$r \leq 2$	$r \geq 3$	12.96	19.72
$r \leq 3$	$r \geq 4$	5.70	6.76
$r \leq 4$	$r = 5$	1.07	1.07
(b) The Variables Included in the Analysis are: rm^b, *rs, ra* and π			
$r = 0$	$r \geq 1$	60.41*	110.29*
$r \leq 1$	$r \geq 2$	28.38*	49.88*
$r \leq 2$	$r \geq 3$	13.08	21.49
$r \leq 3$	$r \geq 4$	7.24	8.41
$r \leq 4$	$r = 5$	1.17	1.17
(c) Name of Variables Included: rm^p, ry^p, *rc*, π and r_b			
$r = 0$	$r \geq 1$	60.34*	119.09*
$r \leq 1$	$r \geq 2$	31.90*	58.75*
$r \leq 2$	$r \geq 3$	16.99	26.85
$r \leq 3$	$r \geq 4$	07.07	09.85
$r \leq 4$	$r = 5$	02.77	02.77

Note: * indicates significant at the 5 percent level.

business sector, real sales (*rs*), the rate of inflation (π), rate of interest on deposits (r_d) and rate of interest on bank advances (r_a). In case of personal demand for money the analysis revealed presence of two cointegrating vectors between the demand for real money (rm^p), real household income (ry^p), the rate of inflation (π), rate of interest on deposits and bond rate (r_b).

5. ESTIMATED LONG-RUN MODELS

The long-run money demand function is obtained by normalising the estimated first cointegrating vector on the real money demand of respective sector. In aggregate money demand analysis, however we find only one cointegrating vector that can be interpreted as long run real money demand function. These long run models are estimated by Johanson (1988) maximum likelihood method. All the parameters are statistically significant at 5 percent level and fulfil the theoretical expectations about the signs.

(a) Aggregate Money Demand

The long run aggregate money demand function is presented as:

$$rm = 1.03\ ry - 14.2\ \pi + 0.64\ rc - 0.49\ rb$$
$$(11.80)\quad (17.75)\quad (4.72)\quad (18.06)\quad \ldots\quad \ldots\quad \ldots \qquad (9)$$

The estimated long run income elasticity of money is close to unity. We formally tested the money-income proportionality hypothesis, which is clearly accepted by the data ($\chi^2 = 0.07$). The restricted model is

$$rm - ry = -14.4\ \pi + 0.63\ rc - 0.44\ rb \qquad \ldots\quad \ldots\quad \ldots \qquad (10)$$

It implies that the long run movement in the velocity of money must be proportional to rate of inflation, rate of interest on deposits and rate of interest on government bonds. The results reveal that the rate of inflation is an important determinant of real money demand behaviour in Pakistan. The estimated coefficient of the rate of interest on bank deposits (own rate) has expected sign (positive). This finding is in direct contrast with that of the earlier studies. They found negative own rate of interest. Furthermore we tested the hypothesis that the difference between own rate and bond rate measures the opportunity cost of holding money. Analysis strongly accepted this hypothesis.

(b) Business Demand for Real Money

The estimated long-run real money demand function by the business sector is also presented below

$$rm^b = 1.23\ rs - 15.07\ \pi + 0.18\ rc - 0.77\ ra$$
$$(9.32)\quad (41.8)\quad (12.19)\quad (13.16)\quad \ldots\quad \ldots\quad \ldots \qquad (11)$$

The estimated coefficient of real sales is greater than one (1.23). We tested the proportionality hypothesis, which is clearly rejected by the data ($\chi^2 = 12.86$). Strange! Other important variables similar to aggregate money demand function are the rate of inflation and own rate of interest. The most important determinant of the real money demand behaviour of the business sector that emerged is the rate of interest on bank advances. The analysis accepts the [Friedman's (1987)] conjecture that the rate of interest on bank advances may play important role in determining the demand for money by the business sector.

(c) Personal Demand for Real Money

The long-run cointegrating relationship between the real personal money demand and its determinants is obtained and results are presented.

$$rm^p = 0.96\ ry^p - 24.77\ \pi + 1.13\ rc - 0.63\ rb \quad \ldots \quad \ldots \quad \ldots \quad (12)$$
$$(8.11) \quad (36.56) \quad (22.48) \quad (9.87)$$

The estimated coefficient of the household income is close to one. To confirm this, we have tested the money-income proportionality hypothesis and accepted by the data (χ^2 = 1.48). It states that the household sector transaction elasticity of real money is equal to one.

$$rm^p - ry^p = -25.33\ \pi + 1.19\ rc - 0.72\ rb \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

This finding is consistent with the finding of the aggregate demand for real money. Our result is different from that of [Laumas and Williums (1983)] who conclude the money is a luxury good for the household sector in India.

The interest rate emerged as an important determinant of money demand for household sector. The worth mentioning results from the analysis is the estimated elasticity of own rate of interest. This indicates that the household sector is highly sensitive to the interest rate on bank deposits. This implies that by manipulation the rate of interest on deposits the authorities can influence the long run saving behaviour of the country.

6. THE SHORT-RUN DYNAMIC MODEL OF MONEY DEMAND

This section presents the estimated parsimonious error correction models of the real money demand. In all models the error correction term consists of the residual from the respective long-run real money demand function estimated in the previous section. We employ general-to-specific methodology to get preferred model. General model of lag length four is first specified and then it is tested down toward data coherent specific model with a battery of diagnostic tests at five percent significant level. The preferred functions are reported in Table 3.

(a) Aggregate Money Demand

The estimated functions show that in the short-run the demand for real M2 is determined by the variations in the level of real income, variations in the short term interest rate and the changes is the rate of inflation. The error correction term is also correctly signed. The coefficient of error correction is –0.06, which indicates that economic agents correct approximately 6 percent of their previous errors in each quarter but the speed of adjustment is slow.

(b) Business Demand for Real Money

The dynamic parsimonious error correction model that emerged is presented in Table 3. The results show that the short run change in the real sales is the most

Table 3

Dynamic Sectoral Money Demand Equations

Aggregate Real M2 (14)			Aggregate Real M2 (15)			Business Real M2 (16)			Household Real M2 (17)			Household Real M2 (18)		
Variables	Est: *P*	*t*-ratio	Variables	Est: *P*	*t*-ratio	Variables	Est: *P*	t-ratio	Variables	Est: *P*	*t*-ratios	Variables	Est: *P*	*t*-ratios
Δry	0.13	5.13	Δry	0.18	5.50	Δrs	0.63	7.51	$\Delta ry^p(-3)$	0.35	13.68	α	0.08	5.91
$\Delta\pi$	–1.10	–7.64	$\Delta\pi$	–1.04	–7.97	Δr_a	–0.50	–2.87	$\Delta\pi$	–0.55	–4.17	Δry^p	0.27	3.31
$\Delta\pi(-1)$	–1.06	–5.72	$\Delta\pi$ (–1)	–1.11	–6.06	$\Delta rm^b(-1)$	–0.19	–2.94	$\Delta\pi(-1)$	–1.05	–6.15	$\Delta ry^p(-3)$	0.41	4.93
$\Delta\pi(-2)$	–1.19	–5.84	$\Delta\pi(-2)$	–1.20	–6.00	$\Delta rm^b(-3)$	–0.21	–2.43	$\Delta\pi(-2)$	–0.89	–4.95	$\Delta\pi$	–0.59	–4.51
$\Delta\pi(-3)$	–0.99	–4.76	$\Delta\pi(-3)$	–0.97	–4.79	ECM(–4)	–0.03	–4.08	$\Delta\pi(-3)$	–0.63	–3.73	$\Delta\pi(-1)$	–0.89	–5.46
$\Delta\pi(-4)$	–0.31	–2.02	$\Delta\pi(-4)$	–0.28	–1.84	S3	+0.29	5.11	$\Delta rm^p(-1)$	–0.18	–3.84	$\Delta\pi(-2)$	–0.83	–4.87
Δr_c	–0.06	–2.69	$\Delta r_c(-1)$	–0.05	–2.20				ECM(–4)	–0.05	–8.12	$\Delta\pi(-3)$	–0.51	–3.10
$\Delta rm(-4)$	+0.38	5.12	$\Delta rm(-4)$	0.37	4.93				DM82	–0.37	–13.12	$\Delta rm^p(-1)$	–0.19	–3.52
ECM(–4)	–0.06	–4.98	ECM(–4)	–0.06	–5.08				S2	+0.13	11.38	ECM(–4)	–0.05	–7.89
S2	+0.07	4.88	S2	0.09	5.38				S3	–0.09	–10.78	DM82	–0.37	–13.49
												S1	–0.15	–4.64
												S3	–0.19	–6.18
R^2	0.66			0.67			0.65			0.85			0.86	
F(11, 106)	24.17			25.19			38.86			63.79			56.62	
Autoχ^2 (4)	4.96			4.96			2.00			6.73			8.41	
Mis χ^2 (1)	2.59			1.64			0.003			0.01			0.12	
Het χ^2 (1)	2.31			2.41			0.13			0.44			0.44	
ARCH χ^2 (1)	0.91			0.37			3.16			0.35			0.05	
Nor χ^2 (2)	5.87			4.81			3.98			5.11			5.99	

important variable in determining the real money demand by the business sector. The estimated transaction elasticity of money is 0.65, which is according to the theoretical predictions. The rate of interest on bank advances is another important variable that significantly determine real money demand in the short run. The speed of adjustment towards equilibrium state is low, that is only 3 percent per quarter.

(c) Real Personal Money Demand

The dynamic error correction model of the real money demand by the personal sector is also estimated. In the short run personal demand for money is determined by the changes in household income, changes in the rate of inflation and previous quarters money holding. The error correction term indicates that the economic agent corrects 5 percent of its past errors in the next quarter.

7. TESTING THE STABILITY AND FORECASTING PERFORMANCE

The estimated dynamic models are tested for any structural break by using [Chow (1960)] analysis of variance test. The results given in Table 4 show that there is no evidence of structural break in any sectors preferred model at the 5 percent significance level. The evidence supports that the estimated error correction model remained stable throughout the estimation period.

Table 4

Test of Stability of the Estimated Error Correction Functions of the Demand for Real M1

	Test of Stability				
	Aggregate		Business	Household	
Time of Break	F(10, 98)	F(10, 102)	F(6, 97)	F(10, 90)	F(11, 933)
1959:3–1971:4	0.79	0.75	0.69	0.48	0.41
1959:3–1973:2	1.12	1.02	0.15	0.42	0.38
1959:3–1980:4	1.12	1.05	1.10	1.44	1.29
1959:3–1985:2	0.33	0.35	2.16	0.00	0.00

Further, the forecasting ability of the preferred functions is examined by the predictive failure test of Chow (1960). The calculated F-statistic for aggregate unrestricted model is F(24, 84) = 0.25 and for restricted equation it is F(84, 88) = 0.26; for dynamic business money demand is F(24, 79) = 0.72 and for household money demand model for the post 1985:2 period is F(24, 76) = 0.67 for the unrestricted equation and F(24, 79) = 0.63 for the restricted. This leads to conclude that the estimated model has good forecasting ability, which indicates that our preferred models do not over or under predict systematically.

8. CONCLUSION AND POLICY RECOMMENDATIONS

Sectoral behaviour of money demand is investigated in this paper by employing cointegration methodology and error correction mechanism. It is found that all the series used in the analysis are non-stationary and could not be used without proper transformation. From the cointegration analysis it is concluded that there is long run relationship between the real money demand and its determinants in both sectors.

Substantial differences between the determinants and estimated elasticities of two sectors' money holding are revealed. The long run real income elasticity of money by the personal sector is less than what obtained for the business sector's sales elasticity of money demand.

Another difference between two sectors is in the interest rates, which appears to have significant effect on the money balances. The business sector seems to have responded the rate of interest on bank advances whereas individuals are more influenced by the long term rates represented by the bond yield. The magnitude of own interest rate elasticity of money balances is another important difference across the sectors. In case of business sector the elasticity is less than one and in case of household it is more than one. It implies that any movement in the rate of interest on deposit have severe consequences for personal sector as compared to the business sector.

The rate of inflation is important in the determination of money demand behaviour. The total impact of the rate of inflation on the money demand behaviour of household sector is higher than the business sector, which implies that the household sector substitutes monetary assets with real assets. In the long run real assets substitution is strong across the sectors, though this phenomenon is strong in personal sector. Whereas in the short run change in the rate of inflation has strong affect on aggregate and personal sector and none on the business sector.

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Comments

The demand for money is a well-researched subject in Pakistan. This paper by Abdul Qayyum is an important addition in this area. He has estimated money demand functions by dis-aggregating business and household sectors and identified different money demand behaviour of these respective sectors. The results of this empirical study has significant policy implications, like any movement in the rate of interest on deposit have severe consequences for personal sector as compared to the business sector. The total impact of the rate of inflation on the money demand behaviour of household sector is higher than the business sector, etc. The study clearly identifies difference in behaviour of the two sectors in terms of determinants as well as in elasticity of these determinants.

I have some observations about the paper.

(i) It requires to include some specific literature review on Pakistan and if possible experience from other developing economies.
(ii) Some of the references quoted in the text are not included in reference list.
(iii) There is no clear mention of the study period.
(iv) The GNP and Sales data are not available on quarterly basis and they are interpolated. However, techniques of interpolation is not provided in this paper. For example, recently many studies have used cubic spline function technique.
(v) Sources of data is not provided clearly for example inflation rate would be a better measure if taken through D(CPI)x 100.
(vi) The lag structure in ADF tests are selected arbitrarily in testing unit roots in the variables. However, Phillips and Perron (PP-test) test could have been a better option to check the stationarity. It also checks the heteroscedasticity and is more powerful test.
(vii) More importantly the rationale for a positive own rate of interest in co-integrating equation has not been provided. As this is in contrast with earlier studies, it needs a clear explanation and interpretations.
(viii) Presentation of tables could be improved by giving variables names in the footnote etc.

Finally, the study has made an important contribution in terms of differentiating the bahaviour of personal and business sector towards real money

balances demand in Pakistan. It is a good academic exercise but to justify the same for policy implications we need to do in-depth analysis and author needs to incorporate the above points.

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