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THE DEMAND FOR MONEY AND THE TERM STRUCTURE OF INTEREST RATES IN PAKISTAN

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The demand for money has been a topic of interest for both the theoreticians and. those formulating monetary policies. At the theoretical levels economists have been concerned with the various issues such as determining appropriate arguments in the money demand function. The analysis of money demand functions is of interest for policy makers because it helps them to forecast money demand and hence determine the appropriate growth rate of money which plays a crucial role in promoting growth and stabilizing the economy.

It is widely agreed upon them that a money demand function should contain a scale variable relating to the level of transactions in the economy and a variable representing the opportunity cost of holding money. However, the controversy looms around the choice of measured or permanent income as a scale variable and the appropriate interest rate(s) to reflect the opportunity cost of money. These issues can only be resolved by an empirical analysis wherein the institutional characteristics, of the economy must be given due consideration.

The empirical analysis of money demand in Pakistan is carried out by Rao and Chaudhry [30], Akhtar [3], Abe and Fry [1], Mangla [27] and Khan [21]. The first three studies focus on the question of testing the complimentarity relationship between money and physical assets and the substitution between money and near monies. All these studies are based on annual data and have specified the conventional money demand functions in which measured income exerts a significant primary influence and interest rates have secondary but important influence on money demand. However, the empirical evidence is mixed regarding which interest rate is the most relevant opportunity cost of holding money. Earlier studies [30, 3] have found support for r_g, the rate of return on government bonds and r_c, the interbank call money rate. Mangla [27] also concludes that r_c is statistically significant while Khan [21] found it to be insignificant. In the latter study, however, the rate of return on time deposits, r_T, turns out to be statistically significant. It is difficult to visualise why only one and not both the interest rates are significant when the two rates are so closely related. Therefore, their evidence needs to be examined once again.

In the conventional money demand function, an average rate of commercial banks' time deposits is taken to be representative of the true opportunity cost and the possibility that interest rates corresponding to time deposits of different maturities may have different effects on the demand for money, has been disregarded. For instance, time deposits of different maturities in Pakistan generally show an upward trend except for the period from 1961/62 to 1963/64 in which long term rates decline while the short term rates rise. Though we get high correlation coefficient between different sets of interest rates, yet on account of the empirical evidence for adverse movements of interest rates, we prefer using the whole term structure of time deposits instead of taking an average of these rates.

The plan of the paper is as follows:

The first section discusses the specification of the model. The second section deals with methodology and data consideration. Section III gives the results of empirical estimation. Section IV tests the stability of the term structure functions. Section V discusses the policy implications of the analysis after comparing the forecasting errors of the term structure equation with the conventional ones. Conclusion of the paper is given in Section VI.

I. MONEY DEMAND MODEL INCORPORATING THE TERM STRUCTURE OF INTEREST RATES

The conventional demand for money function is specified as:

$$M_t = \alpha_o Y_t^{\beta 1} R_t^{\beta 2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where,

M is the demand for money

Y is the scale variable either measured income or the permanent income

R is the opportunity cost variable for holding money balances

t is the time subscript.

For the purposes of estimation, equation (1) may be written as:

$$\text{Log } M_t = \alpha_0 + \beta_1 \log Y_t + \beta_2 \log R_t \quad \ldots\ldots\ldots\ldots (2)$$

It is expected that $\beta_1 > 0$ and $\beta_2 < 0$. When we take the whole term structure of the opportunity cost variable, R_t is replaced by vectors of $\tilde{R}$, i.e.

$$\log M_t = \alpha_o + \beta_1 \log Y_t + \sum_{i=1}^{n} \gamma_i \log R_i \quad \ldots\ldots\ldots\ldots (3)$$

Since R_i's are generally collinear, it is not possible to get accurate estimates of γ_i's. Therefore, to incorporate the term structure of interest rates in the demand for money function, following Heller & Khan [19]* we have replaced the term structure by two parameters, α and γ, obtained by regressing commercial bank deposit rates R_i's for every year against different maturities[2],

$$\log R_{it} = \alpha_t + \gamma_t T_i \quad \text{.......................................} \quad (4)$$

i varies from 1 to 5.

where,

R_{it} is the rate of interest of the ith maturity during the year t.

α_t is a constant and measures the average rate of return on time deposits in each year.

γ_t is the slope of the yield curve and measures the marginal change in the interest rate due to change in maturities for the year t.

T is the maturity period ranging from 1 to 5 within a year.

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*This paper is based on M. Friedman's unpublished paper, "Time Perspective in Demand for Money", University of Chicago, 1977.

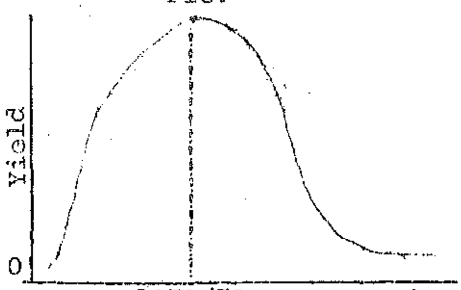
[2] In order to account for the different shapes of the yield curve for the rate of change of slope, we regressed the following function.

$$R_{it} = Ae^{(\gamma_t T_i + \delta_t T_i^2)}$$

or $\log R_{it} = \alpha_t + \gamma_t T_i + \delta_t T_i$

Apriori, we expect the yield curve to give the shape represented by the figure.

FIG.



As the maturity period extended, the yield would fall i.e. after a certain point of time, the nominal rates of interest were realised much higher than the real rates.

The coefficient of δ_t is negative in sixteen out of total twenty observations. However, in the sub-period, 1959-60 to 1970-71 the coefficient is expected to be positive, but it turns out negative in eight observations which is a perverse finding on empirical grounds. Therefore, we estimated equation (4).

It is expected that $\hat{\alpha}_t$, $\hat{\gamma}_t > 0$.

The estimated values, $\hat{\alpha}$ and $\hat{\gamma}$, for all the years are good proxies for R_t, therefore, we substitute them to derive in the following money demand function.

5(i) $\log m_t = a_1 + a_2 \log y_t + a_3(\hat{\alpha}_t) + a_4 (\hat{\gamma}_t)$

where,

m is the real money demand and the equations are estimated for M_1 and M_2 balances.

y is the measured income in real terms.

t is the time script.

Since we are following the argument that all the interest rates together act as the true opportunity cost of holding money, we have introduced the expected inflation rate, $\dot{P}$[3], and the interbank call money rate r_c, one by one with the term structure of time deposits in equations 5(ii) and 5(iii) and then simultaneously introducing both the variables in equation 5(iv). Thus we have the following equations:

5(ii) $\log m_t = a_1 + a_2 \log y_t + a_3(\hat{\alpha}) + a_4(\hat{\gamma}_t) + a_5 \log \dot{P}$.

5(iii) $\log m_t = a_1 + a_2 \log y_t + a_3(\hat{\alpha}) + a_4(\hat{\gamma}_t) + a_5 \log r_c$.

5(iv) $\log m_t = a_1 + a_2 \log y_t + a_3(\hat{\alpha}) + a_4(\hat{\gamma}_t) + a_5 \log \dot{P} + a_6 \log r_c$.

A priori, we expect on theoretical grounds that income elasticity, a_2, is positive and coefficients a_3, a_4, a_5 and a_6 are negative, because they are considered as opportunity costs of holding money balances.

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[3] It is generally argued, e.g. [32], that in LDC, expected inflation rate should be used as a proxy for the opportunity cost of holding money balances. In order to see whether expected inflation rate has its own effect on money demand we introduce it with the term structure of time deposits as well.

II. METHODOLOGY AND THE DATA CONSIDERATION

The annual data on money stock has been taken from Kemal, Bilquees and Khan [20], and on GNP from Pakistan Economic Survey 1980 for the period from 1959/60 to 1978/79. The data on inter-bank call money rate, r_c, have been provided by the Research Department of the State Bank of Pakistan. We include the expected inflation rate, $\dot{P}$, as another variable in the set of explanatory variables, assuming that it acts as the relevant variable for the opportunity cost of holding money balances. The series on inflation rate is the implicit GNP deflator. By assuming constant level of expectations, we take the actual rate of inflation as a proxy for the expected inflation rate.

Since the definition of money is still unresolved We [redacted] deem it better to use both the definitions of money. Money stock has been treated as a proxy for the demand for money, i.e. money market is considered to be in equilibrium. It is assumed that the actual level of money holdings adjust to the desired level within one year. Since in LDC the average per capita income is low, and the expected or anticipated change in income is close to zero, measured income is used as the scale variable[4].

Assuming absence of money illusions, money demand functions are estimated in real terms. It is the real and not the nominal demand which is important; people are interested in the services that money provides not in the absolute nominal sum of money. Measured income and money stock are deflated by the implicit GNP deflator.

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[4] Even if there are expectations of a rise in the income, the decisions have to be made on the basis of increased income in the absence of developed financial institutions which lend money on the collatoral of future income.

III. EMPIRICAL ESTIMATES

a) Conventional Money Demand Function

Theoretically, it is believed that in Pakistan the rate of return on commercial banks' time deposits, r_T, should be considered as a direct opportunity cost of holding money balances. Interbank call money rate, r_c, has only an indirect influence on money demand. However, as the two are so closely related, r_c should also act as the opportunity cost variable contrary to Khan's [21] results. Results reported in table 1 confirm our a-priori expectations.

The differences in result reported in this study regarding r_c and that in Khan [21] are due to the use of inconsistent data on call money rates in the latter study. Since the data on period from 1959-60 to 1965-66 on call money rate for Pakistan were not available in published form, Khan assumed the rates prevailing at Karachi to be representative for Pakistan. Therefore, he spliced series of interest rates prevailing at Karachi during 1959-60 to 1965-66 with that on Pakistan from 1966-67 to 1978-79. However, the unpublished data which we obtained from State Bank showed that the assumption made was implausible

b) Money Demand Functions Incorporating Term Structure of Interest Rates

Using relation (4) we have estimated α and γ — the two parameters which capture the changes in average interest rates and changes in return to different Maturity periods — by regressing the time deposit rates against maturity periods.

Table 1 (a)

Determinants of Demand for Money Corresponding to Real m_1 balances

Author	Period	Equations	R^2	D.W.	F Statistics
Mangla	1958-71	$\log m_1 = \underset{(-4.10)}{-4.66} + \underset{(7.34)}{1.53} \log y - \underset{(-2.06)}{0.18} \log r_c$	0.94	1.34	44.8
Khan	1959-78	$\log m_1 = \underset{(12.1)}{-6.48} + \underset{(19.4)}{1.06} \log y - \underset{(-1.34)}{0.03} \log r_c$	0.96	1.39	263.35
Present Study	1959-79	$\log m_1 = \underset{(3.58)}{-5.95} + \underset{(8.21)}{1.51} \log y - \underset{(-2.42)}{0.34} \log r_c$	0.94	1.53	143.68

(t - Statistics are reported in the parenthesis)

Table 1 (b)

Determinants of Demand for Money Corresponding to Real m_2 balances

Author	Period	Equations	R^2	D.W.	F Statistics
Khan	1959-78	$\log m_2 = \underset{(-12.87)}{-8.43} + \underset{(19.28)}{1.28} \log y - \underset{(-1.14)}{0.03} \log r_c$	0.97	1.37	234.04
Present Study	1959-70	$\log m_2 = \underset{(-4.88)}{-7.08} \quad \underset{(10.28)}{1.64} \log y - \underset{(-2.52)}{0.31} \log r_c$	0.97	1.11	253.22

(t - Statistics are reported in the parenthesis).

Table - 2

Estimations of Real m_1 Balances With Term Structure of Interest Rates

Constant	Measured Income	Reflection of the average interest rate	The effect of interest rate changes due to Maturity time difference	Inflation Rate	Interbank Call Money rate	R^2	Durbin Watson statistics	F Statistics
	Co-efficients of							
C	y	$\hat{\alpha}$	$\hat{\gamma}$	$\dot{P}$	r_c			
-9.17 (-2.86)	1.896 (5.31)	-.75 (-2.52)	-3.53 (-2.19)			.9471	1.44	95.43
-9.23 (-2.88)	1.90 (5.24)	-.76 (2.41)	-3.57 (-2.06)	-.002 (.035)		.9471	1.43	67.14
-9.13 (-2.88)	1.88 (5.33)	-.52 (-1.45)	-2.46 (1.32)		-.19 (-1.14)	.9513	1.56	73.20
-9.16 (-2.72)	1.89 (5.10)	-.52 (-1.38)	-2.48 (-1.25)	-.0008 (-.04)	-.19 (-1.10)	.9513	1.55	54.66

(t - Statistics are reported in the paranthesis)

The estimates of α and γ for all the years, reported in the appendix, show that both α and γ implies that as the maturity period is extended, the yield on commercial banks' deposits increases. In eighteen out of twenty observations, this coefficient is significantly different from zero at 5% level.

In the second stage, money demand equations (5) of the model are estimated with both the definitions of money, M_1 and M_2, using the estimated values of α and γ as the arguments in money demand function.

Looking at Table 2, we observe that income elasticity of M_1 balances in all the equations in greater than unity and is statistically significant. The two parameters, $\hat{\alpha}$ and $\hat{\gamma}$ have the anticipated signs and are significant at 5% level. The coefficient of α explains that as the average rate of return on commercial banks' deposits increases, the demand for money falls significantly, i.e. a uniform upward shift of the entire term structure by one percent will result in a decrease in real balances by .75 percent. A change in the slope of the term structure implies that an increase in the long term rate when the short term rate remains the same, lowers the demand for money by 3.53 percent. When inflation rate is included as another variable, the significance of the other variables is hardly affected. The inflation rate has the correct sign but is statistically insignificant. The inclusion of r_{-} leads to a reduction in significance of $\hat{\alpha}$ and $\hat{\gamma}$. However, the two parameters remain statistically significant at 10 percent level.

Interbank call money rate has the correct sign but is statistically insignificant with the term structure of time deposit rates.

In table 3, we have reported estimates corresponding to M_2 definition of money. Income elasticity of m_2 balances is greater than that of m_1 balances and is significant at 5 percent level. The coefficients of $\hat{\alpha}$ and $\hat{\gamma}$ are smaller and the latter is insignificant. Inflation rate, when included in the specifications, has a wrong sign and is statistically insignificant. Interbank call money rate, r_c, has the correct sign and is statistically insignificant.

The income elasticity of money demand is greater than unity in our analysis which leads us to conclude that there are diseconomies of scale in money holdings[5] but such a conclusion would be unwarranted without capturing the effect of monetisation on money holdings. Earlier study [21] has used the number of bank-branches in the economy as a proxy for the monetisation variable in the money demand function, but that inadequately captures the effect of monetisation. Therefore, no attempt has been made in this study to account for monetisation in the absence of data on the share of GNP marketed.

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[5] Baumol [4] and Tobin [31] introduced this concept in the demand for money function in their Inventory Theoretic Approach where they show that transaction demand for money is sensitive to interest rates and income elasticity is less than unity.

Table 3

Estimates of M_2 Balances with Term Structure of Interest Rates

Constant	Co-efficient of: Measured Income	Reflection of the Average Interest Rate	The Effect of Interest Rate Changes Due to Maturity Time Difference	Inflation Rate	Interbank Call Money Rate	R^2	Durbin Watson Statistics	F Statistics
C	y	$\hat{\alpha}$	$\hat{\gamma}$	$\dot{P}$	r_c			
-11.59 (-4.32)	2.15 (7.19)	-.73 (-2.92)	-2.05 (-1.52)			.9715	1.645	181.65
-11.53 (-4.06)	2.14 (6.75)	-.72 (-2.76)	-2.01 (-1.39)	.0017 (.10)		.9720	1.56	127.81
-11.56 (-4.41)	2.14 (7.32)	-.51 (-1.71)	-1.02 (-.66)		-.19 (-1.33)	.9145	1.522	143.171
-11.46 (-4.12	2.13 (6.84)	-.50 (-1.60)	-.95 (.58)	.0026 (.16)	-.19 (-1.29)	.9513	1.56	73.20

(t - statistics are reported in the paranthesis)

IV. STABILITY OF MONEY DEMAND FUNCTION WITH TERM STRUCTURE OF INTEREST RATES

Stability of the money demand function is tested in order to know whether the model explains movements in the dependent variable over the whole sample period, or its behaviour is different over various periods. Therefore, it has profound implications for the conduct of monetary policy. In order to predict the effect of changes in the supply of money on variables like income, inflation rate and the rate of commercial banks' deposit rates with certainty, the demand for money function should not be unstable.

In Pakistan, the question has become much more relevant because there is a general concern that some sort of structural shift may have occurred after 1971. To check the stability of the demand for money function required in this paper, we have carried out the analysis of covariance. The results are reported in the Appendix, which show no structural shift. The coefficients do not show significant difference between the time periods[6]. Inflation rate remains insignificant, even during the seventies which seems to be contrary to Khan [21] that it has its own significant effect in the money demand function during the Seventies. However, it may be noted that our analysis in no way implies that inflation is unimportant in money demand function because the term structure of interest rates already incorporates the effect of inflation.

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[6] The negative elasticity with M_2 balances in the Seventies needs no explanation as it is insignificant.

V. POLICY IMPLICATIONS

We have argued that money demand functions incorporating the term structure of interest rates is a better specification. Moreover, this turns out to be stable as well. Therefore, forecasting errors are expected to be smaller.

Forecasting of money demand plays an important role for the monetary policy makers especially in an economy where the rate of interest is not determined by the free play of the market forces, rather it is fixed by the monetary authority. There exists just one way causation from the rate of interest to money demand. The stability of the demand for money which yields more accurate forecasts helps the policy maker to know how much should there be the supply of money in order to restore equilibrium in the money market.

We have checked forecasting accuracy of expost forecasts by means of two measures;, namely,

1. The forecast Mean Square Error (MSE)

   Defined simply as:

$$MSE = \Sigma \left[\frac{\hat{m}_t - m_t}{m_{t-1}} \right]^2 \Big/ N$$

where $\hat{m}_t$ and m_t denote the predicted and the realized level of money demand respectively.

2. Theil's inequality coefficient is obtained by dividing the RMSE by the square root of the change in realized level of money demand divided by the number of observations.

i.e.

$$\mu = \frac{RMSE}{\sqrt{\Sigma \left[\frac{\hat{m}_t - m_{t-1}}{m_{t-1}}\right]^2 / N}}$$

if

$\mu = 0$, the forecast is perfect, however, there is no upper limit to the forecasting error.

It is argued that our specification for money demand estimation involving the term structure of interest rates are more stable and forecasting error is smaller than the one for the conventional equations. Forecasting accuracy is tested for the equations where we take only the term structure of time deposits with m_1 and m_2 balances and compare them with the respective equations where an average of the time deposits is taken as an opportunity cost variable.

Table 4

Comparison of the Forecasting Errors of the Two Specifications of the Money Demand Model

Definition of Money	MSE in term structure eq. / MSE in Conventional eq.	μ-Statistics for the term structure eq. / μ-Statistics for the Conventional eq.
m_1	$\frac{.0001147}{.0001877} = 0.6108$	$\frac{.7886}{1.008909} = 0.7816$
m_2	$\frac{.0000821}{.00105} = 0.0809$	$\frac{.6442}{2.359} = 0.2731$

It is seen from the above table that MSE and μ-statistics is smaller for the term structure equation than the ones for conventional equations. With m_2 definition of money, the MSE in the term structure is 92% smaller than that in the conventional equation whereas it is 39% smaller for m_1 balances. The μ-statistics for the term structure equation is 73% smaller than that for conventional equation when m_2 balances are considered whereas for m_1 balances the μ-statistic is 22% smaller than that for conventional equation.

The analysis of demand for money helps the monetary authorities in knowing the amount of monetary expansion to match its demand. A definite relationship should be maintained between the monetary creation and increase in national output. The income and interest rate elasticities determine the total demand in the economy and they are reproduced in the table below for further analysis.

Table 5

Dependent variable	Elasticity of M^d w.r.t.		
	y	$\hat{\alpha}$	$\hat{\gamma}$
m_1	1.896*	-0.75*	-3.53*
m_2	2.15*	-0.73*	-2.05

* Significant at 5% level.

It is seen that the there are no economics of scale in money holding. For instance, if GNP (real) increases by one percent, money demand increases by 1.896 percent. If the average rate of interest on time deposits increases by one percent, the money stock decreases by .75 percent and long term rate of interest decreases by 3.53 percent. The sensitivity of $\hat{\gamma}$ and its significance in money demand function implies that not only the level of interest rates matter, but by manipulating the structure of these rates, objectives of monetary policy can be achieved. However, it may be noted that the monetary policy in our economy is limited to the extent of being able to manipulate the rates of return on time deposits which form a greater portion of the aggregate money balances. Owing to the less developed and narrow security markets [29], the rate of return on government bonds has a little role to play in the framework of monetary analysis in Pakistan.

The desired level of money demand is measured when the bank rate is assumed to be constant over the period from 1976-81.

Table 6

	Period	Growth rate of money Demand (%)	Growth rate of real GNP (%)
$\dot{m}_1$	1978/79	11.76	6.2
$\dot{m}_2$	1978/79	11.33	"
$\dot{m}_1$	1980/81	10.43	5.5
$\dot{m}_2$	1980/81	11.83	"
$\dot{m}_1$	1976-81	13.08	6.9
$\dot{m}_2$	1976-81	14.84	"

It is seen that money demand grows to a much higher level with the growth in GNP and this implies that in order to match the supply of money to its demand the effect is on the rise in the level of prices.

VI. CONCLUSIONS

In this paper, we have hypothesised that interest rates are sensitive to holdings of money in Pakistan and as such both the rate of return on time deposits and the interbank call money rate should have significant effect on the demand for money. The hypothesis has been tested against data relating to the years 1959/60 to 1979/80, and is confirmed; both the interbank call money rate and the commercial bank's time deposit rates are significant opportunity cost variables in the conventional specification of money demand in real terms. The money demand function using the interbank call money rate, r_c, yields similar results as that in Mangla [27]. Our results contradict Khan's findings that interbank call money rate is insignificant — the result which he obtained because of the use of inconsistent data on this variable.

In addition to the conventional practice of taking an average of commercial banks' time deposit rates, we have used the term structure of these rates as money demand would respond differently to interest rates of different maturities. The overall specification of the term structure equations with both M_1 and M_2 balances is good which shows that money demand is responsive not only to changes in the average interest rates but also to the changes in interest rates corresponding to different maturities.

We have regressed two other opportunity cost variables, the expected inflation rate, $\dot{P}$, and the interbank call money rate, r_c, one by one with the term structure of time deposits. $\dot{P}$ appeared an insignificant variable and the coefficients of the term structure and the specifications of the equations are not affected. When r_c is regressed on money demand in the term structure equation, the coefficient has the correct sign but is insignificant at 5% level. The coefficients of the term structure also lose their significance but maintain the correct signs. This shows that r_c is collinear with the coefficients of the term - structure of time deposits rates. Thus, we conclude that one should take the term-structure of time deposits which act directly on money demand and also incorporates the effect of expected inflation rate.

All the equations are estimated in real terms assuming absence of money illusions. As the previous studies do not show a significant difference between measured income and permanent income as the scale variable, we have considered only measured income in our analysis. The coefficient is significant at 5% level, and we do not observe economies of scale.

The term-structure specification of money demand is found stable over time and this specification is more informative with respect to short and long term interest rates. The forecasting error measured by the Mean Square Error (MSE) and Theil's inequality coefficient (μ-statistics) show a significantly smaller error for the term structure specification than for the conventional one.

The high elasticcity and significance of the slope coefficient implies that if long term rates are increased on commercial banks' deposit, people would reduce their demand for money.

Appendix Table (a)

Average Yield And **The** Yield **With** Maturity Period on Deposits

	$\hat{\alpha}$	$\hat{\gamma}$		$\hat{\alpha}$	$\hat{\gamma}$		$\hat{\alpha}$	$\hat{\gamma}$
R_{59}	.82	.08	R_{68}	1.44	.09	R_{77}	2.20	.03
	(25.4)*	(5.76)*		(43.80)	(6.32)*		(58.02)*	(1.64)
R_{60}	.92	.08	R_{69}	1.46	.09	R_{78}	2.22	.02
	(87.29)*	(19.21)*		(26.52)*	(4.17)*		(73.9)*	(1.60)
R_{61}	.91	.12	R_{70}	1.49	.08			
	(37.54)*	(11.84)*		(17.56)*	(2.36)*			
R_{62}	.91	.12	R_{71}	1.56	.07			
	(29.68)*	(9.33)*		(19.75)*	(2.24)*			
R_{63}	.92	.11	R_{72}	1.59	.06			
	(25.49)8	(7.65)*		(30.02)*	(2.74)*			
R_{64}	1.02	.11	R_{73}	1.86	.06			
	(63.35)	(16.86)*		(25.73)*	(2.03)*			
R_{65}	1.13	.11	R_{74}	2.01	.06			
	(70.22)	(16.83)*		(30.35)*	(2.23)*			
R_{66}	1.20	.13	R_{75}	2.08	.05			
	(74.94)*	(15.82)*		(37.71)*	(2.35)*			
R_{67}	1.34	.08	R_{76}	2.15	.04			
	(128.45)*	(19.06)*		(44.63)*	(2.07)*			

Appendix Table (a)

Estimation of Real M_1 Balances with Term Structure of Interest Rates by Analysis of Covariance

Eq. No.	Dependent Vari.	log y	$\hat{\alpha}$	$\hat{\gamma}$	log $\dot{P}$	log r_c	D	D log y	D $\hat{\alpha}$	D $\hat{\gamma}$	D log $\dot{P}$	D log r_c		R^2	D.W	F Stat.
i.	log M_1	-6.54	1.59	-.43	-3.07			23.45	-2.14	-.096	12.58			.956	1.557	36.92
		(-1.16)	(2.48)*	(-.69)	(-1.39)			(.95)	(-.90)	(-.099)	(.09)					
ii.	log M_1	-6.61	1.60	-.43	-3.10	-.0004		26.73	-2.50	.18	15.43	-.004		.956	1.56	23.94
		(-.91)	(1.92)	(.55)	(-1.06)	(-.017)		(.43)	(-.42)	(.11)	(.34)	(-.07)				
iii.	log M_1	-6.83	1.62	-.23	-2.34		.19	24.47	-2.27	-.16	-14.36		-.24	.959	1.66	25.74
		(-1.14)	(2.38)*	(-.34)	(-.34)		(.85)	(.83)	(-.80)	(.12)	(-.80)		(-.35			
iv.	log M_1	-6.88	1.64	-.25	-2.4	-.001	-.18	25.76	-2.40	-.10	-15.16	.02	.23	.959	1.66	16.85
		(-.89)	(1.82)	(-.28)	(-.73)	(-.04)	(-.76)	(.35)	(-.33)	(-.335)	(-.28)	(.02)	(.23)			

Appendix Table - c

Estimations of M_2 Balances with Term Structure by Analysis of Covariance

Eq. No.	Dependent variable	Constant	log y	$\hat{\alpha}$	$\hat{\gamma}$	log $\dot{P}$	log r_c	D	D log y	D$\hat{\alpha}$	D$\hat{\gamma}$	D log$\dot{P}$	D logr_c	R^2	D.W.	F-Statistics
v.	log M_2	-7.35 (-1.83)	1.66 (3.64)	-.22 (-.49)	-1.09 (-.61)			28.06 (1.62)	-2.56 (-1.51)	-.05 (-.07)	-17.06 (-2.09)			.9828	2.11	97.96
vi.	log M_2	-6.00 (-1.18)	1.51 (2.57)*	-.07 (-.14)	- .51 (-.21)	.009 (.50)		25.23 (.58)	-2.26 (0.54)	-.224 (-.20)	-16.46 (-.51)	-.027 (.06)		.9832	2.14	65.13
vii.	log M_2	-7.56 (-1.78)	1.68 (3.64)	-.07 (-.14)	-.54 (-.30)		-.14 (.90)	2.89 (1.39)	-2.65 (--1.32)	-.23 (-.25)	-18.22 (-1.44)		-.17 (-.35)	.9841	1.88	68.73
viii.	log M_2	-6.28 (-1.14)	1.53 (2.43)	-.06 (-.10)	-.0003 (-.0001)	.009 (.44)	-.14 (.80)	23.05 (.45)	-2.04 (-.40)	-.53 (-.27)	-15.20 (.40)	-.08 (-.115)		.9845	1.942	46.16

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