Determinants of Money Demand in Pakistan: Disaggregated Expenditure Approach

Abdullah, Muhammad and Chani, Muhammad Irfan and Ali, Amjad

National College of Business Administration and Economics (NCBAE), Lahore, Pakistan, Research Foundation for Humanity (RFH)

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Muhammad Abdullah

Ph.D. Scholar, National College of Business Administration and Economics (NCBA&E), Lahore, Pakistan

Email: mabdullah7586@hotmail.com

Muhammad Irfan Chani

Ph.D. Scholar, National College of Business Administration and Economics (NCBA&E), Lahore, Pakistan

Amjad Ali

Ph.D. Scholar, National College of Business Administration and Economics (NCBA&E), Lahore, Pakistan

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Abstract

The main focus of the study is to find the determinants of money demand in Pakistan. We used disaggregated expenditures approach in this regard. To find the co-integration among the variables of the model, Johansen co-integration approach is utilized. The results of the study show that the co-integration exists among the variables of the model. The long run elasticities of the study reveal that money demand is positively and more elastic to investment expenditures, household expenditures and government expenditures respectively. It is less elastic to expenditures on exports and price level in Pakistan. Time trend plays a very significant role in determining the money demand in case of Pakistan. In the short run only one period lagged money demand, investment expenditures and prices are significantly elastic to demand for money. The results of the short run also show the convergence in the long run.

Introduction

The demand and supply side behavior of money have got much importance since the days of Friedman. Now a day, money demand plays a critical role in designing the monetary policy as well as macroeconomic analysis of the economy (Sriram, 1999). For conducting a successful monetary policy and choice of its tools and intermediate targets, the knowledge about those factors which affect the money demand is very important. The stable and managed money demand function is required for policy analysis and forecasting (Judd and Scadding, 1982 and Friedman, 1987).

The conventional theories of money demand assume that if the economy is closed then money demand is determined on the basis of income, opportunity cost and country's overall interest rate. According to Friedman (1956), there exist a stable long run relation among real income, real money balances, and real interest rate (the cost of holding money). Worldwide efforts, both theoretical and empirical, have been carried out to determine the factors of long run money demand. Many researchers have estimated money demand function in Pakistan using different co-integration techniques (Akhtar, 1974; Mangla, 1979; Khan, 1980; Qayyum, 1998, 2005 and Zakir, 2006). In these studies, real GDP or real GNP is used as a single measure of aggregate demand variable.

However, different components of demand (expenditure components) might have different impact for money demand. There may be an aggregation bias in the model, if we use a single variable (aggregate demand) in the specification of money demand function (Tang, 2002). Therefore, we have used expenditure components (consumption expenditure, investment expenditure, government expenditures and exports) by disaggregating the real income (aggregate demand). We have also included inflation in the model to discover a consistent association between money demand and expenditure components.

The emerging economy of Pakistan has been facing the fluctuations in macroeconomics variables throughout its history including GDP and therefore demand for money. Its average growth rate of GDP was 5.2 percent from 1972-2010 ranging from

2 percent in 2000-01 to 9 percent in 2004-05. However, the economy could not maintain the significant growth momentum, as its economic growth was just 2.6 percent on average during last three years. There are many reasons behind this decline of growth momentum, for example, world financial crisis, trade shocks, security hazards, war on terror, high profile killings and devastating floods during 2010-11(Govt. of Pakistan, 2010-11). Though, both the fiscal policy and monetary policy have played prominent role for sustainable economic growth. These also influence the expectations about the future inflation and financial markets. During the fiscal year 2010-11(July-April), Government borrowing to support its budget and other commodity operations of Rs. 342.2 billion against Rs. 286.4 billion during July-April 2009-10 and Rs. 239.5 billion during 2008-09 (July-April). The persistent rise in government borrowing has also increased the demand pressures (Govt. of Pakistan, 2010-11).

Literature Review

Relationship between demand for money and output has been explored theoretically and empirically by many researchers. David Hume (1970) investigated how monetary policy should help for smoothing the output of an economy. He observed that an increase in the supply of money favored industrial output. Rise in the price of one good sets a stage of new prices for all the goods. As a result new species of good also introduced in the market.

Lucas (1972) gave a complete picture of the ways on which money injects the economic activities of an economy. As a Walrasian auctioneer, he explained that money works as market clearing agent. Lucas pointed out although workers are aware about the form and model of their expectations but they respond positively to their nominal wages. Workers also take this increase as real and increase their supply of labor more than the price of those goods they buy. If we see the monetary policy case of both developed and under developed countries, we find that money demand has important implications. M2 plays an effective role as policy target variable in macroeconomic variables like real interest rate and economic activity.

Fielding (1994) investigated the function of money demand for four countries of Africa, including Cameroon, Kenya, Ivory Coast and Nigeria. The findings of the Fielding supported the co-integrational relationship existed in case of Nigeria. The results further interpreted the evidence of the existence of long term relation among M2, inflation and real income. In economic literature, there are many studies, [Hansen and Kim (1995), Bahamani-Oskooee and Shabsigh (1996), Hamori and Hamori (1999), Bahamani-Oskooee and Barry (2000), Bahamani-Oskooee and Bohl (2000) and Bahamani-Oskooee (2001)] which empirically tested the stability of money demand in the framework of co-integration analysis.

Thornton (1996), used co-integration test and ECM for finding money demand function in Mexico and he investigated long run demand for money which is based on narrow and broad definitions in Mexican for the period 1980Q1–1994Q1. He found that there is single co-integrating relation between M1, M2 and real GDP and the 91-day Treasury bill rate. The results of short-run equations suggested that M2 is better for targeted aggregate monetary policy. For suggesting appropriate scale, he preferred real GDP instead of real private consumption in case of Mexico.

Khalib (1999) specified the function of money demand for some selected open Asian economies like South Korea, Singapore and Philippines. For measuring the function he used foreign income, domestic income, foreign interest rate, domestic interest rate, and depreciation of exchange rate.

Nwaobi (2002) used Johansen co-integration for finding long run relation of supply of money, inflation, real GDP and rate of interest for the period of 1960 to 1995. He found that money supply function of Nigerian economy is stable both in long run and short run. Hwang (2002) investigated long run relation of M2 and its determinants real (GDP and real rate of interest) for Korean economy. For finding the co-integration of his model he used Juselius maximum likelihood method of co-integration. He found that M1 did not show any significant relation with its determinants. For better proxy of holding money and for measuring opportunity cost, he argued that long run interest rate is better than short run. According to his results, M2 is better than M1 because M2 (board money) can deeply explain impact of monetary policy on the long run economic growth of Korea.

Qayyum (2005) investigated the money demand of M2 in case of Pakistan by using Johansen co-integration and ECM for finding long run and short run estimates. The estimated parameters were preferred super-exogenous for relevant model and needs for relevant interventions. He concluded that inflation had significant effect in determining the demand of money in case of Pakistan. His estimates also shows that interest rate, market rate and bond yield play significant role in the long run performance of money demand.

Renani (2007) investigated money demand for Iran by using advance method of ARDL for finding co-integration. The estimated results of the study showed the long run stable relation among M1, GDP, exchange rate and inflation. Exchange rate and income elasiticity showed positive coefficients while inflation had the negative coefficient. The results of CUSUM and CUSUM square showed that M1 was stable money demand function for Iran between 1985 and 2006.

Rao (2009) investigated money demand based on M1 of 11 countries of Asia using ARDL method for the data from 1970 to 2007. This technique has advantage over traditional estimates because it reduces the bias of small sample size of variables of the model. The estimated results of study indicated that there was no structural break and demand for money was well-defined in these countries.

Theoretical Framework, Econometric Methodology and data sources

The theories of money demand mainly emphasize on the speculative, transactions, utility or precautionary consideration of money (Laidler, (1993) and Sriram, 1999c). However, these theories use some common variables to find relationship between quantity of money demanded and economy's real sector (Judd and Scadding, 1982). We have derived the function of money demand with the help of income version of quantity equation which states;

$$MV = PY \qquad (1)$$

Taking the income velocity of money (V) constant, we can derive the function of money demand as follows;

$$(M/P)^d = kY \qquad (2)$$

It is assumed that demand and supply of real money balances are equal to each other. $(M/P)^d = (M/P)$.

So therefore;

$$M/P = kY \qquad (3)$$

In a small open economy, we can divide output into its four expenditure components as follows;

$$Y = C + I + G + X \qquad (4)$$

On the basis of above assumptions, we have used the following long-run function of money demand (M2) in the log form:

$$LnM2_t = \alpha_0 + \alpha_1 LnCE_t + \alpha_2 LnIE_t + \alpha_3 LnGE_t + \alpha_4 LnXE_t + \alpha_5 LnP_t + u_t \qquad (5)$$

Where,

*LnM*2 (Broad Money) is taken as money demanded, *LnCE* is the household consumption expenditure, *LnIE* is the investment expenditure, *LnEX* is the exports expenditure, *LnGE* is the government expenditure and *LnP* is GDP deflator. *Ln* is natural log and μ_t is an independently and identical distributed error term.

Data Sources

In this study we have used real money balances as dependent variable, household consumption expenditure (*CE*), investment expenditure (*IE*), exports expenditure (*EX*), government expenditure(*GE*) and GDP deflator (P) as independent variables. The time period for the study is from 1972 to 2010. Data for all variables is taken from World Development Indicators (WDI-2011) online database by World Bank.

Econometric Methodology

Augmented Dickey-Fuller (ADF) Test

When we are dealing with time series data for our empirical analysis, we know that many time series data has unit root problem. For dealing with unit root problem Dickey and Fuller (1981) offered the Augmented Dickey-Fuller (ADF) are utilized. The general forms of the ADF can be written as:

$$\Delta X_t = \delta X_{t-1} + \sum_{j=1}^{q} \phi_i \Delta X_{t-i} + e_{1t} \qquad (6)$$

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{j=1}^{q} \phi_i \Delta X_{t-i} + e_{2t} \qquad (7)$$

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + \sum_{j=1}^{q} \phi_i \Delta X_{t-i} + e_{3t} \qquad (8)$$

Johansen Co-integration

After finding the integration order of variables through some unit root test, co-integration technique is applied. Firstly, the notion of co-integration was established by Engle and Granger (1987). Johansen (1988) offered a better Co-integration test and Johansen and Juselius (1990) more strengthened it for investigating the relationship of variables for long period of time when they have same level of integration. Engle and Granger (1987) suggested two steps estimation for only one co-integrating vector, but Johansen co-integration offered maximum likelihood test for finding the numbers of co-integrating vectors in Vector Autoregressive (VAR) illustration. The VAR can be written as below:

$$Z_t = \alpha_0 + \alpha_t Z_{t-1} + \ldots\ldots + \alpha_k Z_{t-k} + \varepsilon_t \quad (9)$$

Where Z_t is a $(n \times 1)$ vector of variables that are integrated at same order, α_0 is a $(n \times 1)$ vector of constant terms, $\alpha_t \ldots\ldots \alpha_{t-k}$ are parameters and ε_t is the residual term.

To find the short run relationship between money demand and expenditure components, Vector Error Correction Model (VECM) can be written in following form.

$$\ln \Delta M2_t = \alpha_0 + \sum_{l=0}^{n} \alpha_1 \Delta \ln M2_{t-1} \sum_{j=0}^{n} \alpha_2 \Delta \ln CE_t + \sum_{i=0}^{n} \alpha_3 \Delta \ln IE_t + \sum_{k=0}^{n} \alpha_4 \Delta \ln GE_t + \sum_{m=0}^{n} \alpha_5 \Delta \ln XE_t + \sum_{n=0}^{n} \alpha_6 \Delta \ln P_t + \eta ECT_{t-t} + U_t \quad (10)$$

If the coefficient (η) of the term ECT_{t-1} is significant, it is the sign of short run relationship among the variables. The value of (η) also tells the convergence and divergence speed from short run to long run. The negative value of (η) explains the convergence whereas the positive value explains the divergence towards long run. The significance of the ECT_{t-1} with negative sign is another proof of stable long run relationship among the variables (Kremers et al., and Banerjee et al., 1998).

ESTIMATION OF THE MODEL AND EMPIRICAL RESULTS

This study uses the annual time series data from 1972 to 2010 for Pakistan. First of all, to find order of integration, we tested the stationarity of time series used for analysis. We used Augmented Dickey Fuller (ADF) test of unit root proposed by Dickey and Fuller (1979, 1981). The results of the ADF test are presented in the table: 1.A and 1.B.

Table: 1.A Augmented Dickey-Fuller (ADF) Unit Root Test

ADF at level Without time trend			ADF at level With time trend	
Variables	t-Statistic	Prob.*	t-Statistic	Prob.*
LnM_2	-0.597823	0.8593	-3.038656	0.1359
LnCE	-0.891397	0.7802	-3.531748	0.0501
LnGE	-0.665625	0.8431	-1.987115	0.5884

LnIE	-1.562862	0.4914	-1.307377	0.8709
LnXE	-0.426545	0.8943	-2.397798	0.3748
LnP	-0.821907	0.8014	-2.706976	0.2397

Table: 1.B Augmented Dickey-Fuller (ADF) Unit Root Test

ADF at First difference Without time trend			ADF at first difference With time trend	
Variables	t-Statistic	Prob.*	t-Statistic	Prob.*
LnM_2	-4.953099	0.0003	-4.921796	0.0016
LnCE	-7.897030	0.0000	-7.940492	0.0000
LnGE	-10.19106	0.0000	-10.05811	0.0000
LnIE	-5.140795	0.0001	-5.307656	0.0006
LnXE	-6.373604	0.0000	-6.278501	0.0000
LnP	-3.956346	0.0042	-3.881532	0.0230

All the variables are stationary at their first difference and have the same order of integration.

The table: 1. A shows that there is no single variable which is stationary at level and has I(0) order of integration at 5 percent level of significance. The table.1.B shows that all the variables are stationary at their first difference and have the same order of integration I(1). It is the best situation for the utilization of Johansen co-integration approach to find the long run as well as short run relationships among the variables of the model.

Optimal Lag Length

After investigating different lag selection criteria at different lag length, we are able to suggest the one lag as an optimal lag for the variables of the current study. The results are presented in the table: 2.

Table-2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-9.459619	NA	9.75e-08	0.883407	1.150038	0.975448
1	170.3270	287.6586*	2.72e-11*	-7.332972*	-5.466554*	-6.688685*
2	198.2366	35.08635	5.23e-11	-6.870663	-3.404459	-5.674130

* Indicates lag order selected by the criterion
LR: sequential modified likelihood ratio test statistic (each test at 5percent level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Co-Integration among the Variables

Johansen co-integration approach presented by Johansen and Juselius (1990) is utilized for the determination of long-run relationship among the variables of the model. The empirical results of Johansen's co-integration approach are presented in table: 3.

Table-3: Unrestricted Co-integration Rank Test (Trace)

Unrestricted Co-integration Rank Test (Trace)				
H_0	H_1	Trace Statistics	0.05 Critical Value	Prob.[a]
r = 0*	r ≥ 1	101.3441	95.75366	0.0195
r ≤ 1	r ≥ 2	56.74362	69.81889	0.3487
r ≤ 2	r ≥ 3	25.63606	47.85613	0.9006
r ≤ 3	r ≥ 4	10.80221	29.79707	0.9657
Unrestricted Co-integration Rank Test (Maximum Eigen value)				
H_0	H_1	Max-Eigen Statistics	0.05 Critical Value	Prob.[a]
r = 0*	r ≥ 1	44.60044	40.07757	0.0145
r ≤ 1	r ≥ 2	31.10757	33.87687	0.1034
r ≤ 2	r ≥ 3	14.83384	27.58434	0.7612
r ≤ 3	r ≥ 4	7.456126	21.13162	0.9337

[a] MacKinnon-Haug-Michelis (1999) p-values

* Denotes rejection of the null hypothesis at the 0.05 level

For our analysis we used Trace Statistics λ_{trace} as well as Maximum Eigen Statistics $\lambda_{\max}$ for the confirmation of the co-integration among the variables of the model. At 5 percent level of significance, the value of the Trace-test Statistics (101.3411) is higher than the critical value (95.75). In this way the null hypothesis $r = 0$ of no co-integration is rejected and the alternative hypothesis $r \leq 1$ is accepted. The value of Maximum Eigen-test Statistics (44.60) is also higher than that of critical value (40.08) at the level of 5 percent. Thus, null hypothesis $r = 0$ of no co-integration is not accepted and the alternative hypothesis $r \leq 1$ of co-integration is accepted. In this way, the both statistics verify the presence of one co-integrating vector among the variables of the model. So in this way, money demand and money supply (Md=Ms) has long run relationship with disaggregated components of expenditures.

After the confirmation of long run relationship among money demand (LnM2), consumption expenditures of the households (LnCE), expenditures on investment (LnIE), the government expenditures (LnGE), expenditures on exports (LnEX), and GDP deflator (LnP) the long run results of the variables are presented in table: 4.

Table-4: Long Run Relationships

Dependent Variable = LnM_2			
Variable	Coefficient	T-Statistic	Prob-Value
Constant	5.644200	0.943001	0.3532
LnCE	0.445209	2.063152	0.0478
LnGE	-0.380715	-2.837025	0.0081
LnIE	0.520392	3.474556	0.0016
LnXE	0.092031	1.700711	0.0993
LnP	-0.005093	-2.066889	0.0475
TREND	0.112309	10.41365	0.0000

R^2= 0.9989
Adj-R^2 = 0.9987
F-Statistic= 4915.864
Prob(F-statistic)= 0.0000
Durbin-Watson = 1.7038

The results in the table 4 show that the household expenditures has significant impact on money demand, 1 percent increase in household expenditures in the economy of Pakistan bring 0.45 percent increase in the money demand in Pakistan. But there is inverse and significant relationship between expenditure of government and money demand in Pakistan. One percent increase in government expenditures results in 0.38 percent decrease in money demand in Pakistan. Okpara and Nwaoha (2010) in case of Nigeria also found long run negative relationship between money supply and government expenditures.

The investment expenditures have also positive and significant relationship with money demand. Results show that 1 percent increase in investment expenditure increases the money demand 0.52 percent which proves that more investment needs more supply of money. In case of exports expenditures, money demand has positive relationship at 10 percent level of significance, as 1 percent increase in exports results in (0.092) percent increase in the money demand. Significant and negative relationship is found between money demand and price level in Pakistan. As price elasticity is (-0.0051) which shows that 1 percent increase in price level brings negative increment in real money balances (M/P). The coefficient of time trend shows that time plays a very significant role in determine the money demand in case of Pakistan. By using the disaggregated expenditure approach we can judge the main determinants of money demand in Pakistan. We have employed the log-linear specification in the model which is helpful in avoiding estimation bias like multicollinearity (Gafar, 1988).

After finding the long relationship of the variables of the model, we use VECM for investigating the short run relationship of the variables of the model. The short run results are presented in table-5.

Short Run Dynamics

Table-5: Short Run Relationships

Dependent Variable = ΔLnM2			
Variable	Coefficient	T-Statistic	Prob-Value
Constant	0.052226	1.873908	0.0722
$\Delta LnM2_{t-1}$	0.415614	2.999779	0.0059
ΔLnCE	0.256853	1.194715	0.2430
ΔLnGE	-0.159184	-1.833892	0.0781
ΔLnIE	0.392603	2.858451	0.0083
ΔLnXE	0.118425	1.571919	0.1281
ΔLnP	-0.024637	-1.873453	0.0723
ECT_{t-1}	-0.709601	-3.846593	0.0007
TREND	8.35E-05	0.116506	0.9081

R^2= 0.591
Adj-R^2 = 0.466
F-Statistic= 4.704
Prob(F-statistic)= 0.000
Durbin-Watson = 1.768

The results show, in short run money demand is determined by its previous period money demand, past period money demand has significant and positive impact in determining the current demand for money. The elasticity of lag value of money demand is (0.4156) which is very high in short run rather than other variables of the model. In the short run the elasticity of household expenditure is (0.2568 in Pakistan but this relationship is not significant in short run. In case of government expenditures the elasticity is (-0.1591) which highlight negative relationship with money demand in Pakistan. Their relationship is significant at 10 percent which also points out that 1 percent increase in government expenditure bring (-0.1591) percent negative change in money demand in Pakistan. In short run investment expenditures have positive and significant relationship with money demand in Pakistan. The elasticity of investment expenditures is (0.3926) which shows that 1 percent increase in investment expenditure bring (0.3926) percent increase in money demand in Pakistan. The elasticity of exports expenditures is (0.1184) which is insignificant in case of short run. The elasticity of price is (-0.0246), which shows negative relationship of price and money demand in short run and this relationship is significant at 10 percent level. The results show that 1 percent increase in price brings 0.0246 percent decrease in the real money demand in short run in case of Pakistan. The negative sign of ECT is theoretically correct and shows the convergence of the short run to the long run equilibrium. But in case of short run time trend does not play a significant role in determination of money demand in Pakistan. The coefficient of ECT is negative and significant which is further proof of long run relationship of the variables of the model.

Conclusion and Implications

The main aim of the study was to find the disaggregated determinants of money demand in of Pakistan. Johansen co-integration was used for finding the co-integrational relationship among the variables of the model. The long run results of the model explain the elasticities of the independent variables with respect to dependent variable. Household expenditures, investment expenditures and exports expenditures have positive and significant relationship with money demand in Pakistan. But the results of government expenditures and price level in the country showed that they have negative and significant relationship with money demand in case of Pakistan. The overall long run results of variables conclude that the investment expenditures are more elastic as its coefficient is higher than others. The coefficient of the time trend in the results show that time also plays very important role in determining the money demand in Pakistan. On the other hand price is less elastic (negatively) as its coefficient is smaller than others.

The short run results of the study explain the short run elasticities of the variables of the model. The results show in the short run money demand is mainly determined by

its previous period money demand. Unlike the long run, results of household expenditures and exports expenditures become insignificant in the short run. Investment expenditure has positive and significant relationship with money demand in case of Pakistan. The coefficients of government expenditures and price level in Pakistan show that they have negative but significant relationship with money demand in the short run. The coefficient of ECT is significant and has theoretical correct sign which is the further proof of the short run convergence towards the long run equilibrium.

According to the findings of this study, relationship between real money balances and expenditures components might be useful for policy makers in designing a stable monetary policy. M2 is the most reasonable target to maintain the pace of economic growth and to control the inflation. In designing the effective and stable monetary policy, level of investment expenditure and consumption expenditure should be given more importance as compared to government expenditures. Sometimes, the government expenditures might be non-developmental (on defense, subsidies and debt servicing) in Pakistan. On the other hand, consumption and investment expenditure portray the real picture of economic activity of the country.

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