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Demand for money in Pakistan

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This study is an empirical investigation of the relationship between M2, gross domestic product, inflation rate and interest rate. The study used secondary data obtained from Pakistan IMFs (World Development Indicators) over the period 1976-2012. Reliability and viability of the data is checked through various sources like IFS and World Bank. For estimation ADF (augmented dickey fuller) unit root test, Johansen's co-integration tests and error correction analysis have been conducted in order to get reliable and verified results for this research. There exists a significant impact on real demand for money in the relationship between M2, gross domestic product, interest rate and inflation in Pakistan.

Key words: Reliability, viability, co-integration.

INTRODUCTION

Demand for money is the most important and critical topic of macroeconomic. This article is on forecasting the demand for money and the analysis of the policies adopted by the under developed countries (Judd and Scadding, 1982; Friedman, 1987).

Under developing countries of Asia like India, Pakistan and Bangladesh ignore the time value of money in policies development. This study is fresh analysis of the current scenario of Pakistan for developing future analysis of monetary economics and its role in the demand for money in the long run and short run; it also shows the relationship between long run and short run functions of money.

Monetary policies made by the central bank of the countries should effect the monetary policy inflation, depreciation, amortization, depletion, devaluation and terrorism.

We applied econometric methodology to the Pakistani case. The Pakistani case is especially interesting in the light of reforms undertaken in the last decade for which no attempt has yet been made to study the impact of these reforms on the stability of demand for money. These issues have not caught up with the research on developing countries though the processes of reforms in general and financial sector reforms in particular are an overriding phenomenon in the past decade. The effects of this underlying financial innovation process highlight the transition from one regime to the other which neces-sarily follows that such a process has to be accounted for in the long-run demand for money estimation

The feature which distinguishes this paper from the others addressing the same issues for a developing economy undergoing financial sector reforms is: this paper uses an alternative econometric methodology testing procedure to evaluate the stability of demand for money accounting for structural breaks in the demand for money specification

LITERATURE REVIEW

In literature, the study and estimation relating to the demand for money has gained much attention and popularity in recent times. Hussain et al. (2006) used time series data for 33 years to estimate the money demand and conclude that the demand for money is stable during the period under review.

Pradhan and Subramanian (2003) used monthly data of Indian economy from 1970 (04) to 2000 (03) for estimating the demand for money. They conclude that financial innovation and changes affect stability but the demand for money in India is stable during the period

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under review.

Bahmani-Oskooee and Wing (2002) used quarterly data of Hong Kong from 1985 to 1999 for estimating the long run demand for money by employing Autoregressive distributed lag co Integration procedure (ARDL) and suggest the existence of co integration between M2 and its determinants and also that the demand for money is stable in Hong Kong.

Qayyum (2005) employed co integration test and error correction method for estimating the relationship between M2 and selected variable, like government bond yield, call money rate, real income and rate of inflation. By using data from 1960 to 1999, he concludes that money demand is affected by rate of inflation in the long run. He further concludes that market rate, bond yield and inflation rate are important for money demand behavior in the long run and that the model can be used for policy making.

Koskinen (1997) used multivariate technique of co integration and nonlinear trend to model the demand for money. By using data from 1980 to 1996 of Finland he concludes that if VAR model is extended then missing co integration relation is found between broad money and scale variables and that the space of co integration can be identified.

By using data from 1951 to 1991, Hossain (1994) estimates the stability of demand for money by employing the co integration test; he concludes that there exists a long run relationship among real output, real narrow or broad money balances and interest rate.

Owoye and Onafowora (2007) use quarterly data of Nigeria from 1986 to 2001 for finding the relationship between real broad money, inflation rate, foreign interest rate, domestic interest rate, expected exchange rate and real GDP. They employed vector error correction technique of co- integration and conclude that there exists a relationship between the variables; further CUSUM and CUSUMSQ reported that stability of real demand money in the short run as well as in the long run.

By using data from 1980 to 1994 of Malaysia and employing co integration and error correction methodology for estimating the demand for money of Malaysia, Marashdeh (1997) concludes that demand function is stable during the period under review. He further concludes that the variables, interest rate, price, exchange rate, income and money balances are co- integrated.

Sterken (2004) used quarterly data of Ethiopia from 1966 to 1994 for estimating the stability of the monetary conditions. He concluded that inflation has negative effect on money in the short run, real per capita money demand is influenced by population growth and no evidence of the impact of exchange on money is reported. He further concludes that narrow money demand is stable for Ethiopian economy.

Bjornland (2005) estimates the demand for money in Venezuela over the period 1985 to 1999. The finding reveals the existence of long run relationship between exchange rate, interest rate, inflation, real income and real money and remains stable over the period under review. Inflation and exchange rate have negative effect on real money demand and interest rate has positive effect on real money.

Jayaraman and Ward (1998) used quarterly data of Fiji from 1979 to 1996 for estimating the money demand model. They found that money demand function is stable during the period under review. They further reveal that long run income elasticity of demand was close to unity.

Choi and Oxley (2001) used quarterly data from 1990 to 2000 for estimating short run and long run money demand function in New Zealand by employing co-integration and error correction method. There exists a long run relationship between price, income and interest rate.

Loizos and Thompson (2002) used quarterly data of Greece form 1962 to 1998 for estimating the demand for narrow money. Johansen co- integration was employed for long run relationship and found that there exists a long run relationship between M1 and other variables, index of industrial production, interest rate and inflation. Error correction model reveals that the error correction term is significant and signed correctly.

Kumar (2010) used data from 1975 to 2007 of five Pacific Island countries for estimation by using panel co-integration method for narrow money. The results suggest that there exists a unique long run relationship between narrow money, nominal rate of interest and real income. The results suggest that money demand is stable and financial reforms have no significant effects on Pacific Island Countries.

Hwang (2002) used quarterly data of the Korean economy from 1973(1) to 19973(2) for estimating the relationship of M1& M2 with its determinants, real income, and interest rate. There exists a long run relationship between M2 and its determinants while M1 does not have any significant relationship with its determinants. He further concludes that broad money is a better measure than narrow money for long run economic impacts in Korea.

Model

In this study, money demand relationship is investigated by the following model:

$$M2=\alpha+\beta_1 GDP+\beta_2 INF+\beta_3 INT+e$$

Where,

M2= Broad Money
GDP= Gross Domestic Product
INF= Inflation Rate
INT= Interest Rate
e = Error Term

Table 1. ADF unit root test: level series.

Variables	ADF	C.V.(5%)
M2	-3.170905	-3.568379
GDP	-3.287258	-3.562882
INF	-2.505822	-3.562882
INT	-0.937864	-3.562882

Note: ADF shows that there is unit root in the series. Null hypothesis is not rejected at 5% level of significance.

Definitions of variables

M2

Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition of money supply is frequently called M2; it corresponds to lines 34 and 35 in the International Monetary Fund's (IMF) International Financial Statistics (IFS).

Gross domestic product

Annual percentage growth rate of GDP at market prices is based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Inflation rate

Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.

Interest rate

Lending interest rate is the rate charged by banks on loans to prime customers.

Collection of data

Annual data from world development bank (WDI, 2010) has been collected from the selected variables. The data of the variables are M2 (Broad Money) GDP (Gross Domestic Product), INF (Inflation Rate) and INT (Interest Rate). The data of all the concerned variables have been collected in percentage.

METHODOLOGY

Unit root test

The first step is to check whether the variables under review are stationary or not. In this paper, Augmented Dickey-Fuller (ADF) test was used to check the order of integration.

Co- integration test

After evaluating the stationary of the variables, the next step is to find out whether they are co- integrated or not using Johansen and Juselius's (1990) framework. In co-integration trace test and Maximum Eigen value statistics are used.

Error correction model

If Johansen and Juselius's (1990) framework shows at least one co- integration at 5% level of significance, then we move on to the error correction model.

Collection of data

The study used annual data for the variables M2, Gross Domestic Product, Interest rate and Inflation over the period 1976-2008. The data are obtained from World Development Indicators of World Bank.

Testing for stationary

First step is to check whether the variables under consideration are stationary or not. A univariate analysis is carried out to check the stationary of the data. Table 1 represents the results of Augmented Dickey Fuller Test (ADF) for the levels and Table 2 represents first difference of all the variables. According to the results shown in Table 1, augmented dickey fuller test indicates that level of the series contains unit root. In order to make the data stationary, unit root test is run again by taking first differences of all the series. Table 2 shows that first difference series are stationary.

Testing for co- integration

After identifying that all the variables in the study are

Table 2. ADF unit root test: 1st difference series.

Variables	ADF	C.V.(5%)
∆M2	-4.961532	-3.574244
∆GDP	-4.856163	-3.560623
∆INF	-5.725620	-3.568379
∆INT	-6.181253	-3.568379

Note: ADF shows that there the series are stationary. Null hypothesis is rejected at 5% level of significance.

Table 3. Johansen co- integration test.

Variable	Hypothesized No. of CE(s)	Eigen value	Trace statistic	5% critical value	Max-eigen statistics	5% critical value
M2	None*	0.780659	63.79733	54.07904	45.51379	28.58808
GDP	At Most 1	0.324517	18.28354	35.19275	11.76982	22.29962
INF	At Most 2	0.163877	6.513716	20.26184	5.369400	15.89210
INT	At Most 3	0.037426	1.144316	9.164546	1.144316	9.164546

*denotes rejection of the null hypothesis at 0.05 level. Variable/series: M2, GDP, INF, INT.

Table 4. Dependent variable ∆M2.

Variables	Coefficient	Std. error	t-statistic	Prob.
∆GDP	-0.631957	0.261697	-2.414839	0.0241
∆INF	0.089902	0.142189	0.632272	0.5334
∆INT	-0.689941	0.218430	-3.158636	0.0044
EC(-1)	-0.414604	0.126396	-3.280191	0.0033

integrated of order one, I(1), the second step is to test whether the variables are co-integrated or not. For this purpose Johansen and Juselius's (1990) co integration tests are employed.

$Y_t = \Gamma_1 (L) Y_{t-1} + \Gamma_2 (L) Y_{t-1} + \ldots\ldots\ldots\ldots \Gamma_p (L) Y_{t-1} + \epsilon_{t-p}$

Where,

Y_t =[M2,GDP,INF,INT] is a column vector and $\Gamma_i (L)$ with I =1 ……..p is lag operator ϵ is white noise residual of zero mean and constant variance. The order of the model p must be determined in advance using the SIC (Schwartz Information Criterion). The null hypothesis that there are fewer co integration vectors can be tested using the following two test statistics.

The results of Johansen co- integration are reported in Table 3. Both the tests (Trace tests and Maximum Eigen Value) show the existence of unique co- integration among the variables at 5% level of significance. This indicates that the variables under consideration are driven by at least one common trend. This implies that the relationship between the variables is not spurious and that they move together. So, there exists a relationship between these variables

Error correction model

The results of error correction model are presented in Table 4. The error correction term is negative and significant which is the indication that there exists a relationship between the variables. The sign of the error term is negative which means that it is convergent towards equilibrium and magnitude shows that 41% adjustment is done in first period. The probability is less than 5% which means that the relationship is significant.

Conclusion

The paper tries to test whether there exists a stable long-run money demand function for Pakistan which experienced high inflation during the analyzed period. The series were also tested for *Johansen's co-integration* and

Unit root. Since test results showed Co integration among the variables, Error correction model ECM was used.

The aim of the study is to find out the relationship between M2 and gross domestic product, interest rate and inflation rate of Pakistan. Johansen's co-integration approach indicates that there exists a long run relationship between M2, gross domestic product, interest rate and inflation. It is found that domestic asset holders view the holding of physical assets as an attractive alternative to monetary assets because in the long run real assets substitution is strong as well as in the short run. However, the response of the call money rate is very low and negative both in the short and long run.

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