P-ISSN: 2709-6254	Journal of Development and Social Sciences	Oct-Dec 2021, Vol. 2, No. IV
O-ISSN:2709-6262	http://doi.org/10.47205/jdss.2021(2-IV)20	[242-248]

Journal of Development and Social Sciences
www.jdss.org.pk

RESEARCH PAPER

Revisiting the Linkage between Money Supply and Income: A Simultaneous Equation Model for Pakistan

[1] Zenab Faizullah [2] Dr. Shahid Ali [3] Muhammad Imad Khan*

1. Ph. D Scholar, Department of Economics, University of Peshawar, KP, Pakistan
2. Assistant Professor, Department of Economics & Development Studies, University of Swat, KP, Pakistan
3. Lecturer, Department of Economics & Development Studies, University of Swat, KP, Pakistan

PAPER INFO

Received:
July 24, 2021
Accepted:
October 15, 2021
Online:
October 20, 2021

Keywords:
Money Supply, Income, Simultaneous Equations

***Corresponding Author:**
mik.usafzai@gmail.com

ABSTRACT

A reliable estimate of the money supply is an important sign of the Gross Domestic Product (GDP) and many other macroeconomic indicators. It is widely discussed that over a long period of time, there is a strong link between GDP and money supply. This link is significantly important for formation of monetary policy. The main aim of this study is to estimate the income-money supply model for Pakistan. This study estimates the income-money supply model for Pakistan over the period of 2009 to 2019. The study uses Two Stage Least Square (2SLS) econometric technique due to the presence of endogeneity problem in the model under consideration. The existence of simultaneity between money supply (M2) and income (GDP) is also clear from the results of Hausman Specification test for simultaneity between M2 and GDP. The results further show that there exists a strong money-income relationship in case of Pakistan.

Introduction

Monetarists strongly believe in the existence of monetary policy where they consider money supply as the main instrument to achieve macroeconomic goals (Friedman & Meiselman, 1963; Cho, 1979). Hence, monetarists believe that monetary policy as an important stance to boost the economic activity. Monetary authorities are required to know whether there will be enough money supply to fulfill the demand of economic agents like individuals and investors. A reliable estimate of the money supply is an important sign of the Gross Domestic Product (GDP) and many other macroeconomic indicators. An accurate prediction of the supply of money provides the policy makers a consistent instrument for following and forecasting interest rates. The nexus between money supply and income is an important phenomenon for every economy of the world. Studies have been carried out to investigate the causal link between these two variables. Most of these studies find that expansion in money supply is important for growth (Levy, 2001; Benhabib et al., 2001a; Ajisafe & Folorunso, 2002; Ali et al., 2008; Jawaid et al., 2010). However, these studies single equation frame work to analyze the impact of money supply on growth. Many studies like (Klein, 1977; Chow, 1966; Goldfeld, Duesenberry; Friedman, 1969, Patinkin, 1965; Saving 1971; Poole, 1973) have contributed to the understanding of the determinants of money

supply and money demand. Most literature has examined the money supply and money demand functions in a single equation frame work. Nonetheless, in theory money supply is determined in a simultaneous equation model. If a single equation framework is employed to study the money supply function, the estimators will be biased and inconsistent and therefore, unreliable. Monetary easing resulting in increased money supply is also supposed to be affected by GDP. Accordingly, a single equation technique would provide biased and inconsistent estimators. Hence, this study aims to estimate income-money supply model for Pakistan over the period of 2009 to 2019. It is widely recognized that Money supply should be studied in simultaneous equation model. Therefore, we use the simultaneous equation approach to estimate the parameters of model.

Literature Review

The literature on the determinants of money supply and money demand is quite rich (Klein, 1977; Chow, 1966; Goldfeld, Duesenberry; Friedman, 1969, Patinkin, 1965; Saving 1971; Poole, 1973). Moreover, a bulk of literature is carried out to investigate the link between money and income (Auerbach and Rutner, 1975; Abbas, 1991; Hussain, 1991; Choudry, 2002; Bilquees and Mukhtar, 2010; Bilquees et al., 2012; Hsing and Jamal, 2013;). Auerbach and Rutner (1975) studied the relationship between money and income. It was concluded that there was little or no association between money and income for the time period of 1953-1973 in the situation of reduced form model. In the longer time period 1921-1973, two-way causality was found between money and income. A significant and weak association was also recorded between income and money for the time period of 1921-1973. Hussain (1991) also investigated the association between money and income for the time span of 1959-60 to 1988-89 by employing Sim's method. The inferences showed one-way causality from money to nominal GNP. The whole situation was reversed while detecting the regression estimates. One way causality from nominal GNP to M1 was found in case of Pakistan. Abbas (1991) also examined the direction of causation between money and income for Asian countries by using granger causality. The conclusion showed no association between Y and M1 for lag two but it also showed two-way causality between Y and M2 in case of Pakistan. Lag three also showed the same result. For Malaysia bi-directional association was found between money and income but lag three showed income depends on M2. M1 and M2 are not dependent on Y for all lags for India and Korea. In case of Thailand two-way causality found between money and income but for lag one M1 is not dependent on Y while for lag three M2 is dependent on income. Choudry (2002) explored the monetary independence by means of association between money and income for three exchange rate mechanism (Germany, Holland and France) under flexible and fixed exchange rate system for the time span of 1979 -1997. Different tests were employed in these three countries and then between United States (non ERM) and these three countries for the same period. The inferences showed causality from foreign money to domestic money between the ERM nations in all cases but not in case of France to Germany. Causality from US to ERM nations was also recorded. The results also showed that during flexible exchange rate, smaller nation's (Germany, Holland and France) monetary policy is affected by larger nation's (US) policy. But during fixed exchange rate size of the nation does not matters. Bilquees and Mukhtar (2010) carried out critical review on the association between money and income in Pakistan. Many researchers have studied the monetary policy by using different approaches and still the process is continued. The study concluded that almost all the studies had some methodological issues and their conclusions fails to

make a decision about the response of money to economic activity. It is difficult to identify how differences in statistical actions influence these results. Hsing and Jamal (2013) employed three-stage least squares method to estimate the money supply and money demand function for Canada. The study suggested that the output gap and inflation gap are integrated in the money supply function. Real GDP affects the real money demand affirmatively but nominal effective exchange rate and Treasury bill rate affects it negatively. The effect of Treasury bill on real money supply is positive and effect of output gap and inflation gap is negative. Bilquees, Mukhtar and Sohail (2012) studied the dynamic relation between money and different macroeconomic variables like output, prices, exchange rate and interest rate for Pakistan during the time span 1972Q1-2009Q4. The study employed the VECM (vector error correction model), Johansen co integration, and VDCs (forecast error variance decompositions). The study found that in short run money supply can independently boost economic activity. The two-way causality was found between interest rate, money supply and price level and one way causality were running from exchange rate and interest rate to real output level. It is also found that interest rate and money supply causes exchange rate. One way causality was running to price level from all other variables in long run. Ahmed (2013) explored the case of causality between macroeconomic variables for three SAARC countries namely Pakistan, Bangladesh and India. Quarterly data during the period 1972Q1 to 1997Q2 for Pakistan, 1974Q2 to 1998Q4 for Bangladesh and 1967Q1 to 1996Q4 for India were used in the study. The study found interest rate a good policy variable in Pakistan and Bangladesh and money in India. Two-way causality was found between prices and money in Pakistan and Bangladesh. The monetary policy was found important in output determination in case of Bangladesh as compared to India and Pakistan.

From the bulk of research on income-money supply model, it is widely discussed that over a long period of time, there is a strong link between GDP and money supply. This link is significantly important for formation of monetary policy. Hence, to estimate the income-money supply model for Pakistan is the main focus of this study.

Material and Methods

The objective of the paper is to estimate income-money supply model for Pakistan. The literature in the introduction section suggests Money supply should be studied in simultaneous equation model. Therefore, we use the simultaneous equation approach to estimate the parameters of model. To test the simultaneity between GDP and M2 in case of Pakistan, first step of our methodology is to apply Hausman specification test to find the presence of simultaneity between GDP and M2. In the second step we utilize identification techniques to identify the income and money supply equations. Then we apply appropriate simultaneous equation method based on the identified equation.

The data on GDP, M2, investment expenditure (IE), and government expenditure on goods and services (GEGS) are obtained from Handbook of Statistics on Pakistan Economy (2010), published by State Bank of Pakistan.

Income-money supply model

Income function:

$$GDP_t = \beta_{10} + \beta_{11}M2_t + \gamma_{12}IE_t + \gamma_{13}GEGS_t + \mu_{1t} \dots\dots\dots\dots\dots (1)$$

Money supply function:

$$M2_t = \beta_{20} + \beta_{21}GDP_t + \mu_{2t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

$GDP_t = income$

$M2_t = stock\ of\ money$

$IE_t = investment\ expenditures$

$GEGS_t = government\ expenditure\ on\ goods\ \&\ services$

Hausman Specification Test for Simultaneity between M2 and GDP

To obtain the estimated GDP and V_i (the residuals from the regression of GDP on exogenous variables in the model) for the Husman specification test, we run the following regression:

$$GDP_t = \beta_0 + \beta_1 IE_t + \beta_2 GEGS_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Now we regress M2 on estimated GDP and Vi, obtained from equation (3). In this regression if Vi turns out to be significant, then we reject H_0= no simultaneity between M2 and GDP.

Table 1
Output of the Hausman Specification test for simultaneity between M2 and GDP
Dependent Variable: M2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	51.64133	3.413869	15.12692	0.0000
ESTGDP	0.009431	0.004972	1.896791	0.0646
VI	-2.077858	0.776981	-2.674271	0.0108

Since the coefficient of Vi is significant we conclude that there is simultaneity between M2 and GDP. Now we turn to identify the model.

Identification of the model

We use two-stage least squares 2SLS technique if the equation is over identified, the condition for the equation to be over identified is:

Identification of money supply function (equation 2)

$$K = IE, GEGS = (2)$$

$$k = 0$$

$$m = M2, GDP = (2)$$

$$(2-0) \quad (2-1)$$

$$(2) > (1)$$

The money supply function is over identified, and therefore, we use two-stage least squares (2SLS) method to estimate money supply function. In estimating the money supply function, we run a regression of M2 on GDP, and utilize investment expenditures (IE) and government expenditures on goods and services (GEGS) as instruments to generate instrumental variable. The method of 2SLS is built in EViews. The output of the 2SLS is given in the following table:

Table 2
Two-Stage Least Squares (2SLS) estimation results of money supply function:
2nd Stage: Dependent Variable: M2
Instrument list: INV GE MS1(-1) INV(-1) GE(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	1.583	0.854	1.852	0.071
Trend	0.630	0.108	5.807	0.000
Constant	20.618	7.270	2.836	0.007
	F-statistic = 23.845			
	Prob (F-Statistics) = 0.000			

The coefficient of GDP in the money supply function estimated on the basis of two-stage least squares (2SLS) is now unbiased and consistent based on the properties and advantage of 2SLS over ordinary least squares (OLS).

Conclusion

This study estimates the income-money supply model for Pakistan over the period of 2009 to 2019. The study uses two Stage Least Square (2SLS) econometric technique due to the presence of endogeneity problem in the model under consideration. The existence of simultaneity between M2 and GDP is also clear from the results of Hausman Specification test for simultaneity between M2 and GDP. The results of 2SLS econometric technique show that there exists a strong money income relationship in case of Pakistan. The results of the study have strong implications for formulating monetary policy. Monetary authorities are required to identify the required level of money supply to fulfill the demand of economic agents like individuals and investors. An accurate prediction of the supply of money provides the policy makers a consistent instrument for following and forecasting interest rates.

References:

Ajisafe, R. A. & Folorunso, B. A. (2002). The relative effectiveness of fiscal and monetary policy in macroeconomic management in Nigeria. *The African Economic and Business Review*, 3(1), 23-40.

Ali, S. Irum, S. & Ali, A. (2008). Whether fiscal stance or monetary policy is effective for economic growth in case of South Asian countries. *The Pakistan Development Review*, 47(4), 791-799.

Arango, S. & Nadiri, M. I. (1981). Demand for Money in Open Economies," Journal of Monetary Economics, 7(1), 69-83

Baumol, W. J. (1952). The Transactions Demand for Cash: An Inventory Theoretic Approach, Quart. J. Econ. 66, 545-56.

Benhabib J. S. Schmitt-Grohe & M. Uribe (2001a) Monetary Policy and Multiple Equilibria. *American Economic Review* 91, 167–185.

Brunner, K. & Meltzer, A. (1970). Economies of Scale in Cash Balances Reconsidered, *Quart. J. Econ.* 1967, 81, 422-36.

Cho, D. W. (1979). The relative stability of monetary velocity and the investment multiplier in the United States: Some additional evidence. *Southern Economic Journal*, 1285-1291.

Chow, G. C. (1966). On the Long-Run and Short-Run Demand for Money, *Journal of Political Economy*, 74(2), pp. 111-131. doi:10.1086/259130

Clower, R. (1967). A Reconsideration of the Micro- Foundations of Monetary Theory, *Western Econ. J.* 5, 1-8.

Fair, R. C. (1987). International Evidence on the Demand for Money, *Review of Economics and Statistics*, 69(3), pp. 473-480. doi:10.2307/1925535.

Friedman, M. (1969). *The Optimum Quantity of Money*, Chicago, Aldine Pub. Co.

Friedman, M. & Meiselman, D. (1963). The relative stability of monetary velocity and the investment multiplier in the United States, 1897-1958.

Friedman, M. & Schwartz, A. J. (2008). *A monetary history of the United States*, 1867-1960: Princeton University Press.

Galí, J. (2002). *New Perspectives on Monetary Policy, Inflation, and the Business Cycle* (No 8767): National Bureau of Economic Research.

Goldfeld, S. M. Duesenberry, J. and Poole, W. (1973). *The Demand for Money Revisited*,"Brookings Papers on Economic Activity, 577-646.doi:10.2307/2534203

Gordon, R. J. (1984). The Short-Run Demand for Money: A Reconsideration, *Journal of Money, Credit & Banking,* 16(4), pp. 403-434.

Jawaid, S. T. Arif, I. & Naeemullah, S. M. (2010). Comparative analysis of monetary and fiscal policy: a case study of Pakistan. *NICE Research Journal*, 3, 58-67.

Jayaraman, T. K. (2001). Efficacy of fiscal and monetary policies in the South Pacific Island countries: Some empirical evidence. *Indian Economic Journal*, 49(1), 63-72.

Judd, J. P. and Scadding J. L. (1982). The Search for a Stable Money Demand Function: A Survey of the Post-1973 Literature, *Journal of Economic Literature*, 20(3), pp. 993-1023.

Klein, B. (1977), The Demand for Quality adjusted Cash Balances: Price Uncertainty in the U.S. Demand for Money Function, *Journal of Political economy*, 691-715.

Levy, Mickey D. (2001) Don't Mix Monetary and Fiscal Policy: Why Return to an Old, Flawed Framework? *Cato Journal* 21: 2.

Patinkin, D. (1965). *Money, Interest and Prices*, 2nd ed. New York 1965.

Saving, T. R. (1971). Transactions Costs and the Demand for Money, American Economic Review, 61(3), pp. 407-420.

Tobin, J. (1956). The Interest Elasticity of the Trans- actions Demand for Money, *Rev. Econ. Statist*. 38, 241-47.