The Long run and Short run Endogeneity of Money Supply in Pakistan: An Empirical Investigation

By

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Abstract

Using Standard Granger Causality test, this study demonstrates that money supply in Pakistan for the period 1980-2003 is not exogenously determined in the short run. Empirical results support the Structuralists view as well as Liquidity Preference view on money endogeneity. However, it also provides partial support to Accommodationists view of money endogeneity. Nevertheless, in the long run, a time span exceeding twenty-four months, it is the base money that determines the total bank advances. Hence, central bank has considerable influence on money supply in the long run.

Key words: Money supply endogeneity, Post Keynesians, Causality, Trend Stationary
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I. Introduction:

Traditionally the supply of money has been regarded as exogenous. The Post Keynesian economists have seriously questioned the validity of the above general perception[1]. On the basis of historical events and empirical evidences, researchers have strongly maintained that the money supply is determined endogenously. This has been regarded as Post Keynesian invention.

Economists have long debated whether money supply curve is vertical or horizontal. Verticalists contend that money supply depends on total reserves, and reserves are the liabilities of central bank and are exogenously determined by central bank, therefore money supply should be depicted as a vertical line. While Horizontalists argue that during 'market period' central bank sets the interest rate and accommodate, to establish the liquidity of bank deposits, whatever the reserves are demanded. Hence Horizontalists consider interest rate to be exogenously determined while the money supply to be endogenously determined.

Although Post-Keynesians have developed consensus on the endogeneity of money supply, they have different viewpoint about the efficacy of the horizontal money supply curve[2]. Howells (1995) contends that horizontal supply curve do not represent stock of money supply. It simply shows the "flow" of reserve money during market period. However, Lavoie (1996) demonstrated that the horizontal money supply curve could be compatible with different views of Post Keynesians such as non-accommodating

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[1] See Basil Moore (1997), Thomas Palley (1994), Sidney Weintraub (1978)
[2] For a discussion on the points of agreement between various post Keynesian authors see Howells (1997).

behavior of the central bank, financial innovations, portfolio adjustments, liquidity preference theory, and the principle of increasing risk.

More specifically, in Post-Keynesian framework the growth in money supply is often viewed as endogenous. The Post-Keynesian notion of the endogeneity of money supply reverses the simple neoclassical notion that the supply of money is determined through the central bank initiatives that depend on factors outside the financial markets. Post-Keynesians, on the other hand, contend that the supply of money both in terms of its fluctuations and credit availability is determined by factors within the financial markets. According to this argument the monetary authority is unable to control the volume of money stock in the economy simply because the creation of money is demand determined. There are basically three distinct theories of money supply endogeneity: Accommodationists view, Structuralists view and Liquidity Preference view. All these three approaches, however, share a common view that money supply is determined from the demand side within the financial markets.

The theoretical literature has convincingly put forward arguments in favor of money endogeneity[3]. To support this theoretical argument, the empirical literature on the endogeneity of money has vehemently demonstrated that money supply is endogenously determined for various economies. However, all these studies exclusively encompass developed and middle-income economies. Nell (2001), Shanmugam et al (1996), Vera (2001) have presented a time series analysis to test the money endogeneity hypothesis for the case of South Africa, Malaysia, and Spain respectively. To the best of our knowledge, no one has attempted to test this hypothesis for less developed economies including Pakistan. Ironically, Low-income countries are blessed with high unemployment and

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[3] For complete critical survey of Post Keynesian Monetary Economics, see Cottrell (1994)

4

corruption. One prescription that is often suggested by Keynesians is to pursue active monetary and fiscal policies to circumvent the problem of high unemployment. The effectiveness of these policies especially in the short run is seriously undermined due to the presumption that money supply is exogenous. In this paper an attempt has been made to test this presumption that money supply is exogenous both in the short run and in the long run using monthly data from 1980 to 2003.

The study is organized as follows: section II reviews the theoretical and empirical literature, section III describes the data and methodology, and section IV presents the empirical results. Conclusions and policy implications are discussed in the final section.

II. Review of Literature:

Accommodationists view on money endogeneity[4]:

Basil Moore, an ardent proponent of Accommodationists view, considers the credit money to be endogenously determined by the credit worthy borrowers.[5] However, the central bank, as the monopoly issuer of fiat money, can effectively determine the supply price of finance at its discretion. He considers interest rate to be exogenously determined by the central bank. Perceived increase in expenditure requires a greater amount of working capital by firms or an increased demand for money by households, which creates an increased demand for loans from banking system. If loans are granted, it will create deposits. As long as deposits are considered as means of payments, these deposits are reflected in increased money supply. Nevertheless, this increase in deposits ex post requires a greater amount of reserve money. Central bank cannot simply decline a

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[4] Cottrel (1994) termed this view as 'Radical endogeneity theory'
[5] Leading proponents of this view include Kaldor (1982, 1985), Lavoie(1984,1985) Goodhart (1979)
Weintraub (1978a,1978b), and Moore(1979,1983,1985,1988a,1988b 1989,1991).

request for the reserve money because it is responsible for establishing liquidity of deposits.

Structuralists view on money endogeneity:

This approach focuses on the interaction between the monetary authority's policy reaction function and the asset and liability management activities of banks (Palley 1996).[6] Although Structuralists consider money supply to be upward sloping, they emphasize that banking system can effectively circumvent reserve constrained placed by central bank in the long run through innovation of banking services and financial instruments by providing more liquid financial assets. Thus, the money supply curve eventually becomes horizontal.

Liquidity preference view on money endogeneity:

According to liquidity preference view on money endogeneity, it is the relative interest rates that reconcile the decision to borrow with the decisions to hold increased deposits. Arestis and Howells (1996) criticize accommodative view that increase in deposits due to approval of loans by banking system would always be held by the public because of 'convenience lending'. Moreover Arestis and Howells (1996) conclude that it is the changes in relative interest rate that reconcile the demand for additional loans with the demand for additional deposits.

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[6] Leading proponents of this view include Minsky (1982, 1986); Rousseas (1985, 89) Earley (1983), Earley and Evans (1982)

All these views are summarized in table 1.

Table 1[7]
Testable hypothesis for empirical investigation:

Accommodationists View	Structuralists View	Liquidity Preference View
(Moore1989)	(Palley 1996, 1998; Pollin1991)	(Howells1995)
ADVANCES$\Rightarrow$BROAD	ADVANCES $\Leftrightarrow$BASE	ADVANCES $\Leftrightarrow$BROAD
ADVANCES $\Rightarrow$BASE	ADVANCES $\Leftrightarrow$ MUL	
INCOME$\Leftrightarrow$BROAD	INCOME$\Leftrightarrow$BROAD	

Notes: ADVANCES = log-level of total bank advances; BROAD = log-level of broad measure of monetary aggregate; BASE = log-level of monetary base; MUL = log-level of the Broad money multiplier; INCOME = log-level of nominal GNP (money income). "$\Rightarrow$" Denotes unidirectional causality from left to right; "$\Leftrightarrow$" denotes bi-directional causality.

The theoretical literature has convincingly put forward arguments in favor of money endogeneity[8]. To support this theoretical argument, the empirical literature on the endogeneity of money has vehemently demonstrated that money supply is endogenously determined for various economies. However, all these studies exclusively encompass developed and middle-income economies. Nell (2001), Shanmugam et al (1996), Vera (2001) and Pollin (1991) have presented a time series analysis to test the money endogeneity hypothesis for the case of South Africa, Malaysia, Spain, and U.S. respectively. Table 2 provides a quick glance at the empirical literature on the Post Keynesian money endogeneity hypothesis.

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[7] This table is modified version of the table presented by Nell (2001)
[8] For complete critical survey of Post Keynesian Monetary Economics, see Cottrell (1994)

Table 2
Empirical Studies

Authors	Time period	Methodology	Country	Views Supported
Pollin (1991)	1953-1988	Granger Causality	US	Structuralists View
Shanmugam et al (2003)	1985-2000	Cointegration and Standard Granger Causality	Malaysia	Accommodative and Liquidity Preference View
Vera (2001)	1987-98	Granger Causality test	Spain	Accommodative and Structuralists View
Nell (2000-2001)	1966-1997	Error Correction Model	South Africa	All three views

To the best of our knowledge, no one has attempted to test this hypothesis for less developed economies including Pakistan. Ironically, Low-income countries are blessed with high unemployment and corruption. One prescription that is often suggested by Keynesians is to pursue active monetary and fiscal policies to circumvent the problem of high unemployment. The effectiveness of these policies especially in the short run is seriously undermined due to the presumption that money supply is exogenous. In this paper an attempt has been made to test this presumption that money supply is exogenous both in the short run and in the long run using monthly data from 1980 to 2003.

III. Data and Methods:

Monthly Data for the period 1980 to 2003 on the Bank Advances are taken from various issues of Statistical Bulletin of State Bank of Pakistan (SBP). Data on narrow money and broad money are taken from International Financial Statistics (IFS) database 2005. Narrow money includes transferable deposits and currency outside deposit money banks (line 34 in IFS). Broad money is the sum of narrow money and quasi money (line

35 in IFS). Quasi money includes time, savings, and foreign currency deposits of resident sectors other than central government. The ratio of Broad money and Narrow money is used to represent money multiplier. All the above-mentioned series are taken in log monotonic transformation.

Since the monthly series on GDP is not available, we have used a suitable proxy for GDP series. Index of industrial manufacturing has often been used in the literature to proxy GDP[9]. We have used the Quantum Index Number of Manufacturing to proxy GDP. The index is taken from International Financial Statistics database.

Granger (1969) causality test is used to infer statistical precedence of information. 'y' is said to be granger caused by 'x' if 'x' helps in the prediction of 'y'. In Two way causality there is a feedback mechanism. 'x' granger causes y does not imply that 'y' is the manifestation of 'x'. Following is the formulation of granger causality test: The fundamental assumption of granger causality test is that the concerned series should be stationary process that is the mean and variance of the series should be time invariant.

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + ----- + \alpha_T Y_{t-T} + \beta_1 X_{t-1} + ------ + \beta_T X_{t-T} + \varepsilon_t ----------- (1)$$
$$X_t = \alpha_0 + \alpha_1 X_{t-1} + ----- + \alpha_T X_{t-T} + \beta_1 Y_{t-1} + ------ + \beta_T Y_{t-T} + \mu_t ------------ (2)$$

Where T is the time lag. Assuming that underlying series are stationary, simple F test or Wald test can be applied to test the null hypothesis of joint insignificance of independent variable(s).

To apply Granger causality test we need to check the stationarity of all the series. We apply Augmented Dickey Fuller (ADF) test on each variable to check for the presence of a unit root (Dickey and Fuller, 1979,1981). If we cannot reject the null

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[9] Shanmugam (2003) , Nell(2000-1) have used such indices.

hypothesis of a unit root at a reasonable confidence level, we may conclude that the series

are non-stationary in levels. We then take first difference and follow the same ADF test.

If we reject the null hypothesis of a unit root, we conclude that the series are stationary in

first difference or integrated of order one, I (1).

IV. Empirical Results: A visual observation of the time series reveals the presence of trend in the underlying series. Figure 1 clearly shows this pattern.

Figure 1
Graphs on Actual, Fitted Trend and Residuals
(Time Period 1980 - 2003)
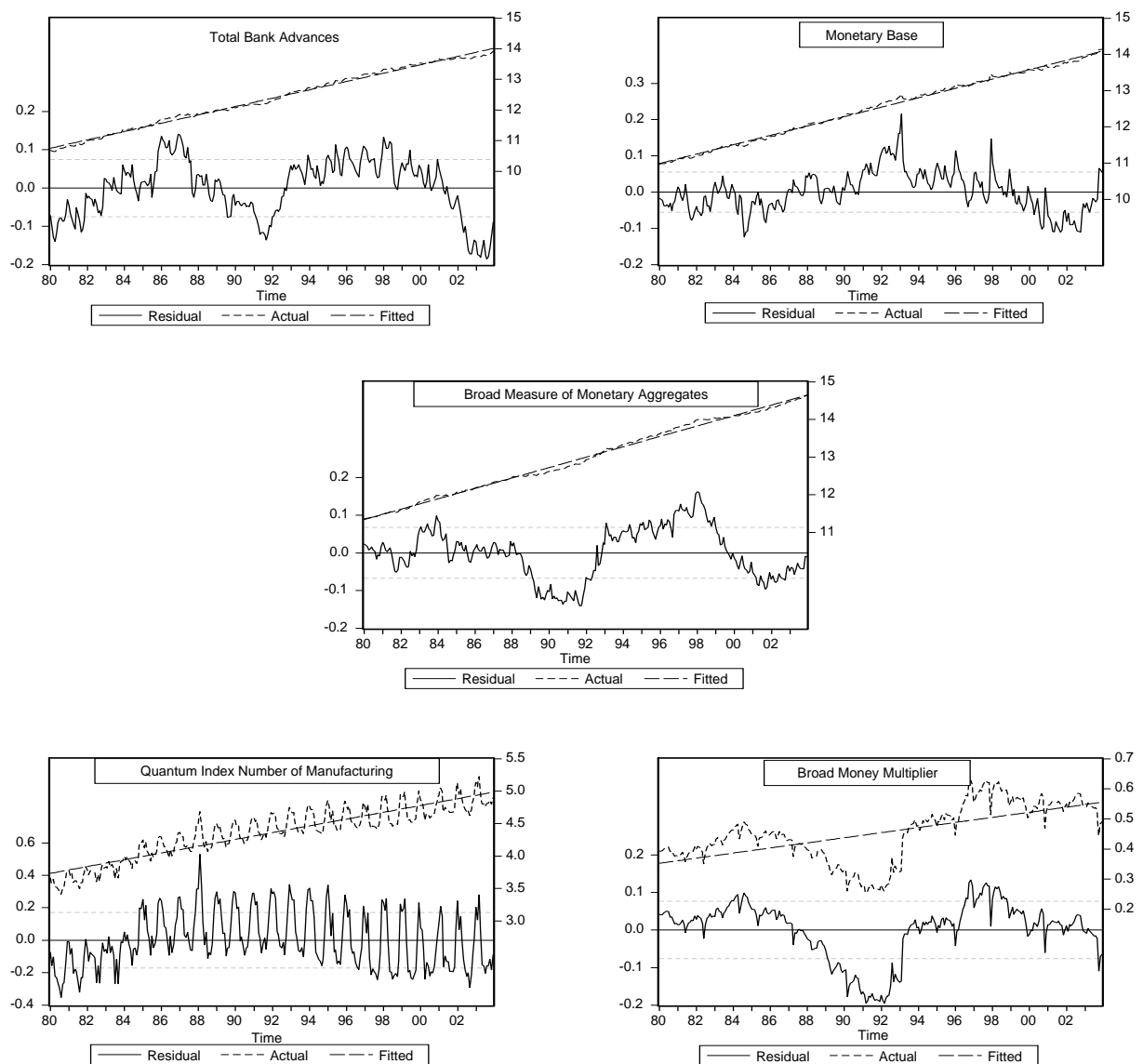
We detrend each series by running the following regression.

$$Y = \alpha + \beta T + u \text{ ----------------- (3)}$$

Where Y is the respective log transformed time series, T, time trend and u is the

residuals. The results are reported in table 4.

Table 4
Regression Results for Equation 3

	Test Statistic	Results	
	Const. (t-statistics)	Trend	F- Statistics (p-value)
ADV	10.07(863)	0.011(213)	45647(0.000)
BASE	10.34(1189)	0.01(273)	74544(0.000)
BROAD	10.65(1013)	0.011(240)	57871(0.000)
MUL	0.31(26)	0.0007(13)	171(0.000)
M_INDEX	3.47(130)	0.0043(36)	1292(0.000)

ADV= log-level of total bank advances; BASE=log-level of monetary base; BROAD=log-level of broad measure of monetary aggregate; MUL=log-level of the Broad money multiplier; M_INDEX=log-level of Quantum Index Number of Manufacturing.

After removing the effect of intercept and trend, we have applied DF/ADF test to determine the presence of unit root. The results are reported in table 5:

Table 5
DF/ADF Test Statistics

ADV	-2.54
BASE	-3.88
BROAD	-2.06
MUL	-2.23
M_INDEX	-5.60

ADV= log-level of total bank advances; BASE=log-level of monetary base; BROAD=log-level of broad measure of monetary aggregate; MUL=log-level of the Broad money multiplier; M_INDEX=log-level of Quantum Index Number of Manufacturing. MacKinnon critical values for rejection of a null hypothesis of unit root 1% (-2.57); 5% (-1.94) ; 10% (-1.6)

All the series are trend stationary process. It is evident that in all the time series,

the proposed filter is highly significant even at less than 1 percent. Furthermore, for all

the series, the null hypothesis of non-stationarity is rejected at 5 percent significance level.

Since all the variables are trend stationary, standard Granger (1969) causality test is applied to the detrended time series. Table 4 tabulates the result of the Granger causality test based on F-statistics. P-values are in parentheses. The test considered 12 different lag lengths that begins with 3 lags and ends with 36 lags.

The empirical results support the two way causality between broad money (BROAD) and the quantum index for manufacturing (M_INDEX) in the short run. By short run we mean a period of 18 months. Thus, our results support liquidity preference view on money endogeneity. However, for duration greater than eighteen months, our results exhibit no causality between money income and broad monetary aggregates. The absence of causality between broad aggregate measure of money supply and the quantum index implies that money does not determine economic growth in the long run.

Table 6
Standard Granger Causality Test

Lag length	ADV⇒BROAD	BROAD⇒ADV	ADV⇒BASE	BASE⇒ADV	ADV⇒MUL	MUL⇒ADV	M_INDEX ⇒BROAD	BROAD ⇒M_INDEX
3	4.75 (0.003)	6.56 (0.000)	5.18 (0.001)	9.37 (0.000)	2.26 (0.08)	3.67 (0.012)	2.84 (0.037)	3.06 (0.028)
6	4.57 (0.000)	4.01 (0.000)	5.50 (0.000)	5.78 (0.000)	2.84 (0.01)	2.74 (0.013)	2.4 (0.028)	2.27 (0.037)
9	3.04 (0.001)	2.69 (0.005)	6.46 (0.000)	4.55 (0.000)	3.9 (0.000)	2.38 (0.013)	3.9 (0.000)	2.49 (0.009)
12	2.01 (0.023)	2.00 (0.024)	3.84 (0.000)	3.55 (0.000)	2.86 (0.001)	1.83 (0.042)	3.55 (0.000)	1.05 (0.401)
15	1.66 (0.057)	1.78 (0.037)	2.17 (0.007)	2.17 (0.007)	1.59 (0.075)	1.12 (0.33)	1.52 (0.098)	1.64 (0.063)
18	1.73 (0.034)	1.72 (0.036)	2.00 (0.01)	1.98 (0.011)	1.76 (0.03)	0.99 (0.469)	1.38 (0.138)	1.51 (0.084)
21	1.48 (0.085)	1.62 (0.044)	1.94 (0.009)	1.71 (0.029)	1.50 (0.076)	0.95 (0.521)	1.13 (0.308)	1.32 (0.157)
24	1.32 (0.152)	1.97 (0.005)	1.58 (0.046)	1.84 (0.012)	1.28 (0.176)	1.23 (0.217)	0.96 (0.516)	1.39 (0.109)
27	1.24 (0.196)	1.74 (0.016)	1.34 (0.13)	1.63 (0.029)	1.08 (0.36)	1.06 (0.38)	0.80 (0.74)	1.28 (0.167)
30	1.19 (0.231)	1.61 (0.029)	1.16 (0.267)	1.51 (0.05)	1.01 (0.45)	0.93 (0.56)	0.85 (0.69)	1.33 (0.126)
33	1.17 (0.247)	1.43 (0.070)	1.08 (0.349)	1.51 (0.045)	0.92 (0.594)	0.97 (0.514)	0.95 (0.542)	1.19 (0.231)
36	1.10 (0.321)	1.40 (0.078)	0.94 (0.562)	1.32 (0.116)	0.72 (0.874)	0.97 (0.50)	0.99 (0.484)	1.41 (0.072)

Values in the cells are F-values while Figures in brackets are P-values. Entries are against Lag length. '⇒' indicates direction of causality.

Notes: ADV= log-level of total bank advances; BROAD=log-level of broad measure of monetary aggregate; BASE=log-level of monetary base; MUL=log-level of the Broad money multiplier; M_INDEX=log-level of Quantum Index Number of Manufacturing.

For twenty-four lags, empirical results support the hypothesis that there exist two way causal relationships between broad money and total bank advances. However, for lag length exceeding twenty-four months, unidirectional causality runs from broad money to the total bank advances. Our empirical findings exhibit non-accommodative behavior of central bank thus, negating Moore (1988b) contention who considers one way causality running from total bank credit to broad money and base money and that a two way causal relationship between money income and broad money.

In the case of base money and total bank advances, there exist two way causal relationship for lag length up to twenty-four months, however for longer lag lengths, this causal relationship exists only in one direction i.e. from base money to total bank advances. Again, for short duration not exceeding twelve months, there exist two way causality between total bank advances (ADV) and broad money multiplier (MUL). Hence our empirical findings strongly support the Structuralists view. While it exhibits one way causality from total bank advances to broad money multiplier for an extended period of twenty four months.

V. Conclusions and Policy Implications:

Using detrended series of narrow money, broad money, broad money multiplier, total bank advances, and quantum index for manufacturing as proxy variable for GDP, we ran standard granger causality test to examine different testable hypothesis of money endogeneity.

Contrary to the general perception in the academic circle that economic time series are differenced stationary we find that both the different measures of monetary aggregates and money multiplier and the proxy for the GDP series are trend stationary

process. In other words, all the series are not integrated series; hence these series are not persistent to shocks.

The absence of causality between broad aggregate measure of money supply and the GDP implies that money does not determine economic growth in the long run; in our case it is beyond eighteen months. However, in the short run, a time-span of eighteen months there exist two way causal relationships between broad measure of money aggregate and the GDP.

Our empirical findings suggest that there is partial support to accommodative endogeneity. Accommodative endogeneity implies unidirectional causality that runs from total bank lending to broad money and to base money and bi-directional causality between money income and broad money. Our study demonstrates bi-directional causality between total bank advances and base money and that for total bank advances and broad money, albeit for short duration – a time span of twenty four months. Furthermore we observe bi-directional causality between money income and broad money again for short duration. This study strongly supports liquidity preference theory of money endogeneity and is consistent with the Structuralists view on money endogeneity.

Finally, the study concludes that money supply in Pakistan is endogenously determined in the short run- a time span of not less than eighteen months. However, in the long run money supply is exogenous. Our findings of one way causality that runs from base money to bank advances and from broad money to bank advances point to the fact that over the longer period – a time period beyond twenty four months, central bank can effectively determine money supply.

The policy implication of this analysis is that the monetary policy can indeed influence financial environment in the long run. Since money supply is endogenously determined in the short run, a lowering of interest rate may result in over investment that consequently spurs inflationary pressures.

16

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